

2-4 Basic Design (Building Part)

2-4-1 Design Concept (Building Part)

Telecommunications play a most important role in the life of a nation, which is comparable to that of the central nervous system in a human body. Telecommunications systems must be sound and reliable, and must be capable of functioning on a permanent basis. They must also be open to expansion in response to needs arising out of future development and alteration of people's life-styles. The buildings accommodating telecommunications equipment, too, must therefore be provided with higher levels of durability, safety and adaptability to future alteration in comparison with ordinary buildings, and must, at the same time, be buildings capable of withstanding and surviving with its functions intact in all kinds of disasters.

The telephone office facilities to be constructed under the present project will be designed in according with the above basic concepts, and with special considerations on the following points.

(1) Natural Circumstances

The city of Phnom Penh, where the project sites are located, is situated in the tropical monsoon zone, where the weather is generally hot and humid, and the spells of concentrated rainfall during the rainy season sometimes results in large parts of the city being inundated. Telecommunications equipment have low resistance to humidity, and inundation of telecommunications facilities will result in fatal damage to the equipment accommodated in them. The telephone office facilities will therefore be provided with high levels of water and damp-proofing, and utmost care will be taken in building planning to prevent water entering the sites on which the facilities are located.

(2) Social Circumstances

The telephone office buildings constructed under the present project are specialized technical facilities accommodating the latest telecommunications equipment, and it is not possible to make these buildings directly expressive of the considerations for the historical/cultural traditions and local life-styles in the host country. In terms of the architectural style, the construction of a building with a large tiled roof, which is the prevalent building style in Phnom Penh at

present, is precluded by the need to erect a roof-top pylon. Since the aim of the present project lies in the provision of assistance in the field of telecommunications to a country setting her feet on the path of modernization and economic development, the emphasis will be on the construction of buildings that will function as models contributing to the future development of telecommunications in the host country, rather than on past tradition and cultural background.

(3) Construction Conditions

Since the construction materials available in Cambodia are limited, the majority of the materials will have to be imported. With a view to facilitating future maintenance of the facilities, imports from Japan will be avoided as far as possible, and the materials will be procured, where possible, in neighboring countries. There are no design standards for telephone office facilities and no established system of regulations for building design in Cambodia. For basic items in the design of the facilities, therefore, reference will be made to the Japanese Building Standard Law and typical design standards used in Japan for telephone offices.

(4) Use of Local Firms

The technical levels and schedule management capacities of the local construction firms are, unfortunately, inadequate for the purpose of the present project, and their role will be limited mainly to provision of labor. Because the present project has to be implemented under an extremely tight schedule, the construction work will be implemented with the participation of engineers from Japan and skilled workers from neighboring countries, and will be used as an occasion for transfer of appropriate technology to the local firms.

(5) Operational Capacity of Implementing Agency

Since this project is the first instance of assistance in the field of telecommunications to Cambodia from Japan, it cannot be said that the implementing agency will be well-acquainted with the operational methods for the latest telecommunications equipment which are to be provided. For an effective operation, therefore, of the facilities and equipment provided under this project, technical cooperation through dispatch of telecommunications experts

from Japan is deemed indispensable, and considerations for such future cooperation will be reflected in the planning of the facilities.

(6) Scale and Grade of Facilities

A glance at the history of telecommunications reveals that the growth in the demand for telecommunications systems has been phenomenal in every country and the rate at which the facilities have had to be expanded has tended to far exceed the original expectations. To deal with such growing demands, the standard practice in the design of telephone offices in Japan is to set the scale of the newly-constructed facilities at a level corresponding to the demand expected fifteen years on from the time of the inauguration of the services. In the telecommunications plans under the present project, the design capacity for the telecommunications equipment has been set at 10,000 subscribers at the time of the inauguration of the telephone offices, with a potential for future expansion of the capacity to 21,000 subscribers, which corresponds to the demand in 2007. The planning scale of the telephone office buildings will be made to correspond with these figures. As for the grade of the facilities, buildings with high levels of durability and safety will be aimed at as mentioned above. Care will be taken, at the same time, to avoid excesses with considerations for the local circumstances and capacity for maintenance and operation.

2-4-2 Basic Design (Building Part)

(1) Site and Facilities Layout Plan

1) Site Conditions

(a) Central Telephone Office

The construction site for the Central Telephone Office is located in the central part of the city of Phnom Penh, by the intersection of two major thoroughfares running through the city, the north-south Boulevard Preah Monyvong and the east-west Boulevard Samdach Preah Sihanouk, and to the west of the "7.1 (D.H.Q.)". The premises here were originally procured by the Ministry of Posts and Telecommunications as a site for its Training Center. Two buildings (both two-storied), with a corridor joining them, were constructed here in 1975. These buildings, however, are not functioning as a

training center at present. The building facing the road in front of the site is being renovated to accommodate switchboard systems which are to be provided through grant aid from the French Government. The northern building is disused and is becoming dilapidated.

The premises cover a more or less flat area, approximately 5,200 m<sup>2</sup> in size with an east-west length of approximately 66 m and a north-south length of approximately 79 m. The Ministry of Posts and Telecommunications has decided to use the northern half of the premises, made available by removing the dilapidated northern building and the corridor, as the site for the new telephone office. While the site available is slightly on the small side for the envisaged scale of the new telephone office, the required floor area can be secured by making the building multi-storied. The conditions otherwise at the site are suitable for the construction of the new telephone office, there being no problems concerning the access to the site, and the area being provided with commercial power supply, as well as municipal waterworks and sewers.

(b) West Telephone Office

The proposed site for the West Telephone Office is located on premises to the south of Santhor Muk School, which faces Boulevard Kampuchea Krom, a road joining the Airport with the Central Market in the center of the city. It has been confirmed that a part of the premises here, which are owned by the Ministry of Transport, will be made available for the construction of the new telephone office.

The construction site is a vacant lot, approximately 30 m by 30 m, and faces on to a road (Street No. 253). It is found halfway along the western edge of the Ministry of Transport premises. While the area available is rather small for the purpose of the construction work, there will be no problems in securing the floor area of approximately 216 m<sup>2</sup>, which will be required of the telephone office building assuming its construction as a single-storied building. As in the case of the Central Telephone Office, the

conditions are good, with no problems over site access, power supply and water supply/drainage.

(c) Airport Telephone Office

The proposed site is a vacant lot facing a road, and can be reached by traveling approximately 600 m northwards along the road originating at the access gate for Pagoda Taing Krasaing, 100 m to the west of the Airport Terminal Building. Unlike the sites for the other two telephone offices, which are located in noisy urban areas, the site here is located in a quiet rural area, and is surrounded mostly by cultivated fields with scattered housing. As with the West Telephone Office, the site is 30 m by 30 m, and is large enough for the construction of the telephone office building envisaged. The site as a whole is found at a lower elevation than the road in front and the ground is uneven, factors which will necessitate filling and leveling. For commercial power supply, a new power line will have to be constructed branching off the high-tension cables running along the road in front of the Airport. As the municipal waterworks do not reach this area, water will have to be secured either by digging new wells or by providing a regular supply by means of tank lorries to the reception tank on site. There are also no public drainage systems in the vicinity. Sewage will have to be discharged to a nearby reservoir via a treatment tank. The road in front of the site is approximately 5 m wide and is unpaved. It will turn muddy during the rainy season, but there should be no problems over access to the site. In this way, the site conditions at the proposed site for the Airport Telephone Office are not exactly satisfactory, but the site here has advantages over the other two sites in its quieter environment, suitable for a telecommunications building where noise and dust should be avoided.

2) Facilities Layout Plan

(a) Central Telephone Office

While the site made available for the Central Telephone Office is rather on the small side, it is possible to accommodate the required facilities on this site by ensuring a compact layout. The site faces on

to roads on its northern and western sides. As the road to the west is wider and is thought to be a main street, the approaches to the customer service area and the staff entrance, as well as the routes for the incoming cables, will all be situated on the western side.

In light of the considerations on the size and composition of the building based on the required floor area, it would seem most appropriate to make the telephone office building a three-story building with 4 x 7 spans. For the purpose of ensuring an effective use of the site, it will be best to locate the building as close as possible to the northwestern corner of the site, and this layout will also have advantages for future use of the premises as a whole including the southern half with its existing building. The southern side of the site will therefore be used for the staff entrance porch and car park, while the eastern part will serve as the outdoor workshop and service area, and an ancillary building accommodating such items as the reception water tank and power generators will be constructed in the northeastern corner of the site.

The site available, however, does not allow for future expansion of the telephone office building. When the need arises in future for the expansion of floor space at the telephone office, the possibilities will be the use of the existing building in the southern half of the premises, construction of a new building on the site of this existing building, or division of the subscriber area and establishment of a new branch telephone office.

(b) West and Airport Telephone Offices

The buildings at both the West and Airport telephone offices will be single-storied buildings with floor areas of around 200 m<sup>2</sup>, and the sites selected are only just large enough for accommodating such buildings, a factor limiting the options available in layout planning and meaning that the buildings will have to be located towards the back ends of the sites. Access routes for cars will be secured along the roads in front of the sites, and the empty spaces on either side of the buildings will be used as service yards accommodating such

items as the oil tanks, reception water tanks and wastewater treatment tanks.

3) Exterior Work Plan

The streets in Phnom Penh are sometimes flooded under 10 to 20 cm of water at times of concentrated rainfall during the rainy season. For the purpose of drainage planning, therefore, fill work will have to be implemented at all the construction sites to raise the ground level above that of the surrounding roads.

At the Central Telephone Office, a retaining wall will be constructed along the drop created by this fill work at the boundary between the site of the new telephone office building and the site of the existing building to the south. The parts of the site accessible to cars will be paved with concrete, while the remaining parts will be covered with gravel. Since the fencing facing the roads has become dilapidated, and there is also a need to alter the positions of the gates under the present project, a new fencing will be constructed. Exterior work here will also include the construction of a guard house, flag pole, fuel tank for in-house power generator, catch basin and wastewater treatment tank.

(2) Building Plan

1) Floor Plan

The cable chambers, in which the incoming telephone cables are accommodated, are normally located underground at telephone offices. While such a setup would facilitate the planning of the aboveground portions of the telephone office building, the construction of a basement solely for the cable chamber would lead to an increase in the construction costs and prolongation of the construction period, which would outweigh the advantages. Furthermore, a basement would be unsuitable in Phnom Penh, where the groundwater level is high and where the streets are liable to flooding during the rainy season, and there is a need rather to raise the ground floor level for the purpose of preventing flood damage. For these reasons, the cable chamber at the Central Telephone Office will be located on the ground floor.

The basic pattern normally used at telephone offices will be used in the floor planning, with the ground floor accommodating rooms with strong connections with the outside world (customer services office, service order/OSPM office) and rooms for installation of especially heavy objects (power room). The first floor will be occupied mainly by machinery-related rooms (MDF/test board room, switching equipment room etc.), which will be positioned in such a manner as to ensure function in line with the flow of the telephone cables. The second floor will accommodate such rooms as the manual S/W room and the billing center, as well as two classrooms for staff training, which were specially requested as a means of compensating for the removal of the existing training center building. Besides being used as the base for the stayed radio pylon, the roof will also be used to accommodate the outdoor units of air conditioners.

The staircases, toilets and kettle rooms on each floor will be positioned near the middle of the building to ensure convenience in their use, as well as to ensure an economic layout of the installations and to facilitate possible future alteration. On the first and second floors, corridors will be provided connecting the staircases with the balconies on the eastern side, which are used as entrances for equipment, so as to secure escape routes in two directions at times of emergency. On the second floor, which will be taken up mostly by habitable rooms staffed by large numbers of workers, balconies will also be provided on the northern and southern sides and large window openings will be provided to create an open atmosphere. Besides improving the habitability, the balconies are also used as escape routes in emergencies, as well as for drainage from the air conditioners installed on the second floor.

The rooms are listed with their functions and the factors used in the calculation of the room areas on the following page.

2) Sectional Plan

As has been mentioned above, fill work is to be implemented at the Central Telephone Office site. The ground floor level will be raised a further 1 m above the ground level on site. The height of each story will be determined by the equipment accommodated and the wiring for them. The rooms determining the floor heights are the power room (below-beam



height: 4.0 m) on the ground floor, the MDF/test board room (below-beam height: 4.0 m) on the first floor, and the manual S/W room (ceiling height: 3.0 m; below-beam height: 3.7 m, with space for installation of air-conditioning ducts) on the second floor. False ceilings (ceiling height: 2.7 to 3.0 m) will be used in all rooms except the machinery rooms and the storerooms. The height of the roof-top radio pylon will be 35 m (height above ground: 50 m).

At both the West and Airport telephone offices too, the floor level will be raised 1 m above the surrounding ground as at the Central Telephone Office. The incoming cables will be accommodated in trenches below the floor, as the cables here are fewer.

Rooms Required with their Functions and Areas (1/5)

[Central Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
Ground Floor	Cable chamber	Cable lead-in, branching and connection to MDF	120	Steps down to underground cables, cable racks: 80 m <sup>2</sup> ; working and cable storage space: 40 m <sup>2</sup> total: 120 m <sup>2</sup>
	Customer services office	Receipt/handling of subscription applications, telephone charges, complaints, applications for installation of public telephones etc.	102	Clerical staff: 5 m <sup>2</sup> /person x 24 = 120 m <sup>2</sup>
	Lobby	Waiting area for customer services office; also used for installation of public telephone booths, display cases for telephone sets etc.	58	Telephone booths: 12 m <sup>2</sup> ; lobby space: 2 m <sup>2</sup> /person x 20 = 40 m <sup>2</sup> total: 120 m <sup>2</sup>
	Customer reception room	Meetings with bulk users (consultation, complaints etc.)	16	2 m <sup>2</sup> /person x 8 = 16 m <sup>2</sup>
	Document store	Storage of subscriber registers and service records	8	0.0003 m <sup>2</sup> x 21,000 subscribers + 3 m <sup>2</sup> = 9.3 m <sup>2</sup> (NTT standard)
	ACMR (1)	Installation of air-conditioning equipment for lobby, customer services office and customer reception room	24	Based on equipment layout
	Hall	Entrance hall for telephone office staff	72	-
	Service order/OSPM office	Office/waiting space for technicians responsible for maintenance/installation etc. of outside plants (OSP) and customer equipment	192	Plant maps: 14 m <sup>2</sup> ; working space: 12 m <sup>2</sup> ; computers: 34 m <sup>2</sup> ; staff space: 3 m <sup>2</sup> /person x 40 = 120 m <sup>2</sup> total: 180 m <sup>2</sup>
	OSPM staff outfit store	Storage of work boots, waterproofs, safety kit, tools etc. for OSPM staff	24	0.4 m <sup>2</sup> /person x 40 + 8 = 24 m <sup>2</sup> (NTT standard)
	OSP equipment store	Storage of materials, parts, tools etc. for outside plant work	60	1.3 m <sup>2</sup> /person x 40 + 10 = 62 m <sup>2</sup> (NTT standard)
	Power room	Installation of power units for conversion of received power into low-voltage DC and batteries for use during power failure	184	Rectifiers: 24 m <sup>2</sup> /set x 3 = 72 m <sup>2</sup> ; batteries: 30 m <sup>2</sup> /set x 3 = 90 m <sup>2</sup> ; UPS etc.: 30 m <sup>2</sup> total: 192 m <sup>2</sup>
Power equipment store	Storage of spare parts for power room equipment	24	Power room area x 1/10 = 19.2 m <sup>2</sup>	
First Floor	MDF/test board room	Installation of main distribution frame(MDF) and test boards for telephone lines; line tests, receipt and repair of malfunctioning equipment, preparation of statistical records etc.	198	MDF: 120 m <sup>2</sup> ; test board/repair counter: 60 m <sup>2</sup> total: 180 m <sup>2</sup>
	Equipment store	Storage of spare parts for MDF/test boardroom equipment	9	MDF/test board room x 1/20 = 9 m <sup>2</sup>
	ACMR (2)	Installation of air-conditioning equipment for MDF/test board room	27	Based on equipment layout
	Administration office	Personnel management, accounting, general affairs, facilities management etc.	36	Clerical staff: 5 m <sup>2</sup> /person x 6 = 30 m <sup>2</sup>

Rooms Required with their Functions and Areas (2/5)

[Central Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
First Floor	Director's room	Office for director; also used for receiving visitors and for small meetings	36	Director: 18 m <sup>2</sup> ; visitors/meetings: 18 m <sup>2</sup> total: 36 m <sup>2</sup>
	Spare room	As office for technical cooperation experts etc.	36	Experts etc.: 8 m <sup>2</sup> /person x 4 = 32 m <sup>2</sup>
	Switching equipment store	Storage of spare parts for switching equipment	24	Switching equipment room area x 1/10 = 21.6m <sup>2</sup>
	Switching equipment room	Installation of automatic switching equipment for connection of local and long-distance calls	216	Local calls: 36 m <sup>2</sup> /5,000 subscribers x 4 = 144m <sup>2</sup> ; long-distance calls: 36 m <sup>2</sup> /2,500 subscribers x 2 = 72 m <sup>2</sup> total: 216 m <sup>2</sup>
	Anteroom	Dust prevention for switching equipment room (space for changing footwear)	6	Based on furniture layout
	ACMR (3)	Installation of air-conditioning equipment for switching equipment room	36	Based on equipment layout; includes passage for equipment access to switching equipment room
	Control equipment room	Installation of consoles for controlling switching equipment	60	5 m <sup>2</sup> /set x 12 = 60 m <sup>2</sup>
	T/R equipment room	Installation of radio equipment for transmission of long-distance calls, television broadcasts etc.	72	Transmission equipment: 32 m <sup>2</sup> /set x 1 = 32 m <sup>2</sup> ; radio units: 40 m <sup>2</sup> /set x 1 = 40 m <sup>2</sup> total: 72 m <sup>2</sup>
	T/R staff room	Office/waiting space for technicians responsible for maintenance of radio equipment	48	3 m <sup>2</sup> /person x 12 = 36 m <sup>2</sup> ; spare parts for radio equipment: 8 m <sup>2</sup> total: 44 m <sup>2</sup>
S/W staff room	Office/waiting space for technicians responsible for maintenance of switching equipment	36	3 m <sup>2</sup> /person x 12 = 36 m <sup>2</sup>	
Second Floor	Collecting office	Dispatch/accounting for telephone bills	144	Address printer: 34 m <sup>2</sup> ; staff: 4 m <sup>2</sup> /person x 15 = 60 m <sup>2</sup> ; storage: 50 m <sup>2</sup> total: 144 m <sup>2</sup>
	Billing center	Calculation of telephone charges and preparation of bills	144	Computer for calculation of charges: 34 m <sup>2</sup> ; staff: 4 m <sup>2</sup> /person x 20 = 80 m <sup>2</sup> ; storage: 30 m <sup>2</sup> total: 144 m <sup>2</sup>
	Meeting room	Used for meetings between internal departments and conferences with outside bodies, as well as for miscellaneous purposes	60	3 m <sup>2</sup> /person x 20 = 60 m <sup>2</sup>

Rooms Required with their Functions and Areas (3/5)

[Central Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
Second Floor	Classroom (1)	Classroom/teaching equipment store for Training Center	72	Trainees (x 20): 48 m <sup>2</sup> (based on desk layout);teaching equipment/practical training space: 24m <sup>2</sup> total: 72 m <sup>2</sup>
	Classroom (2)	Classroom/teaching equipment store for Training Center	72	Trainees (x 20): 48 m <sup>2</sup> (based on desk layout);teaching equipment/practical training space: 24m <sup>2</sup> total: 72 m <sup>2</sup>
	Instructors room	Waiting room for instructors for Training Center	36	Instructors: 5 m <sup>2</sup> /person x 4 = 20 m <sup>2</sup> ; teaching equipment: 12 m <sup>2</sup> total: 32 m <sup>2</sup>
	ACMR (4)	Installation of air-conditioning equipment for manual S/W room	30	Based on equipment layout
	Bedroom	Resting/waiting space for manual S/W staff on night duty	24	6 m <sup>2</sup> /person x 4 = 24 m <sup>2</sup>
	Manual S/W room	Connection of calls by manual switching systems and directory inquiry service	132	Counters for manual S/W equipment, inquiry services, monitoring etc.: 4.8 m <sup>2</sup> /set x 30 = 144m <sup>2</sup>
	Locker room	Changing/resting space for manual S/W staff	18	0.3 m <sup>2</sup> /person x 60 (30 x 2, including replacement staff) = 18 m <sup>2</sup>
	Customer premises equipment repair room	Repair of subscriber and public telephone sets, switching equipment cords etc.	90	Repair work space: 5 m <sup>2</sup> /person x 6 = 30 m <sup>2</sup> ;storage: 60 m <sup>2</sup> total: 90 m <sup>2</sup>
	Spare ACMR	For future installation of air-conditioning equipment for collecting office and billing center	30	Based on equipment layout
All Floors	Toilets (male)	On all floors	18 x 3	All floors: stalls x 2; closets x 2; wash basins x 2
	Toilets (female)	On all floors	18 x 3	Ground & first floors: closets x 2; wash basins x2 Second floor: closets x 3; wash basins x 2
	Kettle room	On all floors	8 x 3	Basin, wall cupboard
	Communal space (staircases, corridors etc.)	Access to all floors and rooms	468	
Telephone Office Building Total			3,164	

Rooms Required with their Functions and Areas (4/5)

[Central Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
Ancillary Building-1	Pump room	Installation of pumps for raising water to roof-top tank	19	Pumps (x 2), control panel
	Reception water tank space	Water tank for reception of municipal water supply	19	Reception water tank
	Generator room	Installation of generators for power supply during power failure	59	Generators (450 kVA) x 2
Ancillary Building-1 Total			97	
Ancillary Building-2	Guard room	Monitoring/waiting space for guards	16	3 m <sup>2</sup> /person x 3 + 5 = 14 m <sup>2</sup>
	Verandah	For standing guard	6	
Ancillary Building-2 Total			22	
Central Telephone Office Total			3,283	

Rooms Required with their Functions and Areas (5/5)

[West Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
Ground Floor	Machinery room	Installation of MDF and switching equipment; includes office/working space of patrolling maintenance staff	132	Based on equipment layout
	Anteroom	Heat insulation and dust prevention for machinery room (space for changing footwear)	8	Based on furniture layout
	Toilet		4	Closet x 1; wash basin x 1
	Generator room	Installation of generators for power supply during power failure	36	Generators (100 kVA) x 2
	Power room	Installation of power units for conversion of received power into low-voltage DC and batteries for use during power failure	36	Based on equipment layout
West Telephone Office Total			226	

[Airport Telephone Office]

	Room	Function	Design Area (m <sup>2</sup> )	Basis for Area Calculation
Ground Floor	Machinery room	Installation of MDF and switching equipment; includes office/working space of patrolling maintenance staff	96	Based on equipment layout
	Anteroom	Heat insulation and dust prevention for machinery room (space for changing footwear)	8	Based on furniture layout
	Toilet		4	Closet x 1; wash basin x 1
	Generator room	Installation of generators for power supply during power failure	36	Generators (70 kVA) x 2
	Power room	Installation of power units for conversion of received power into low-voltage DC and batteries for use during power failure	36	Based on equipment layout
Airport Telephone Office Total			186	

(3) Structural Plan

1) Foundation Structure

According to the report of the geological survey carried out by the Ministry of Posts and Telecommunications at the site of the Central Telephone Office, the soil near the ground surface consists of sandy clay and clay, and the bearing capacity of the ground 1 to 2 m below ground surface at present is estimated at approximately 6 tons/m<sup>2</sup>. This is inadequate as the bearing layer for the Central Telephone Office building, which is to be a three-storied reinforced concrete building with a 35 m high pylon on its roof. A pile foundation will therefore have to be provided to utilize the clay layer with N-values of around 25, found 11 to 15 m below ground surface, as the bearing layer.

For the purpose of this piling work, driven piles and cast-in-situ piles are unsuitable in view of such factors as the effects of vibration on the surrounding area, the high groundwater level and the possibility of borehole collapse in the soft surface soil. Piling will therefore have to be implemented by means of bored precast piles or ground improvement piles, which have both been used in the past in Phnom Penh. In a study conducted to compare the costs and time required for piling work by these two methods, it was found that ground improvement piles would be more economical by far. The foundation for the Central Telephone Office building will therefore take the form of an individual footing foundation, constructed with ground improvement piles.

The two ancillary buildings at the Central Telephone Office are both small, single-storied buildings. These can be constructed on spread foundations, after replacement and adequate compaction of the soil immediately below the foundations. No geological survey results are available at present for the sites of the West and Airport telephone offices, but the geological conditions here are thought to be similar to those at the site of the Central Telephone Office. Since the buildings here are small, single-story buildings, the same type of foundations will be used for them as for the ancillary buildings at the Central Telephone Office.

2) Determination of Design Loads and External Forces

(a) Dead Load

In addition to the dead weight of the buildings, the total weight of the stayed pylon to be erected on the roof will be taken into consideration for the Central Telephone Office building.

(b) Live Load

For the machinery-related rooms, the live load will be determined from the weights of the machines which are to be accommodated in them, and on the basis of similar rooms constructed in the past in Japan. For the other rooms, the Structural Design Standards issued by the Architectural Institute of Japan will be applied.

(c) Wind Load

No accurate data could be obtained on the maximum instantaneous wind speed at the project sites, but the maximum wind speed recorded in the past in Phnom Penh is reported to be 20 m/s. Adding an allowance reflecting the importance of the buildings, a value of 30 m/s will be used as the design standard wind speed.

(d) Seismic Load

No data could be obtained on the seismic conditions during the Field Study. According to a map of seismic hazard in areas subject to seismic activity throughout the world, given in the Report of the Building Research Institute of the Ministry of Construction, Japan (vol. 88, Feb. 1988), the maximum acceleration expected in an earthquake likely to occur in Cambodia, even at a return period of 200 years, is only 20 gal. The response acceleration in buildings of the type envisaged under the Japanese Building Standard Law is generally 2.5 to 3.0 times the maximum acceleration of the input seismic waves. The standard shear coefficient in the buildings under consideration will therefore be 0.05 to 0.06. In the design calculations here, a value of 0.1 will be used to guarantee safety.



3) Structural Design Standards

Since there are as yet no established standards for structural design in Cambodia, the Structural Design Standards issued by the Architectural Institute of Japan will be applied.

(4) Building Equipment Plan

1) Electrical Installations

The following electrical installations will be provided at the Central Telephone Office.

(a) Mains and Power Wiring

The mains will include those for lighting/socket outlets, power wiring, and emergency power supply. While the possible wiring methods include those using cable racks, metal ducts, metal conduits and hard vinyl chloride conduits, cable racks and hard vinyl chloride conduits will be used here to ensure economy and facility of installation.

(b) Lighting Equipment/Socket Outlets

Fluorescent lamps, which are superior in terms of the color of the light produced and economy, will be used as the main light sources. The levels of illumination for each room, determined on the basis of the Japan Industrial Standards (JIS) and with reference to the local conditions, will be as follows.

Switching equipment room, manual S/W room, T/R  
equipment room, control equipment room, office  
rooms etc. : 400 lx

Power room, ACMR's, staff rooms, generator room  
etc. : 200 lx

Corridors, staircases, toilets, storerooms etc. : 100 lx

The types of lighting equipment used will be as follows.

Switching equipment room, manual S/W room, T/R equipment room, power room etc.	:	suspended lighting with reflectors
Office rooms, staff rooms, meeting room, instructors room, classrooms etc.	:	open recessed lighting
ACMR's, equipment stores	:	surface-mounted lighting

Besides the socket outlets for general-purpose use, socket outlets for specific purposes (maintenance of telecommunications equipment etc.) will be installed as required. The shapes and specifications of these outlets will be those normally used in Cambodia.

(c) Loud Speaker System

A loud speaker system will be installed as required to allow announcements/calls to be made from the administration office to various habitable rooms.

(d) Automatic Fire Alarm System

In view of the importance of the telecommunications facilities, the minimum number fire alarms necessary will be provided. These will include smoke detectors for machinery rooms (switching equipment room, power room etc.) and corridors, spot-type rate-of-rise detectors for other habitable rooms, equipment stores etc., along with manual alarms and alarm bells installed at strategic positions in corridors etc. and a receiver in the control equipment room for constant monitoring of the situation.

(e) Telephone Conduit System

Conduits for telephone lines will be laid between terminal boxes and from terminal boxes to telephone outlets to allow the installation of telephone sets at the required positions in each room.

(f) TV Antenna System

The required wiring, splitters and antenna outlets will be installed to allow reception of TV broadcasts in the director's room, bedroom etc. via a master antenna.

(g) Clocks

Battery-driven wall clocks will be installed at appropriate positions in each habitable room.

(h) Earthing System

The following earthing systems will be provided for electrical installations and telecommunications equipment.

High-voltage equipment (15 kV)	:	up to 10 W
Low-voltage equipment (444/230 V)	:	up to 100 W
Main distributing frame (MDF)	:	up to 10 W
Telecommunications equipment	:	up to 10 W
Lightning protector	:	up to 10 W

(i) Lightning Protection System

A lightning protection system will be installed on the radio pylon to prevent damage to the building by lightning.

At the West and Airport telephone offices, the following electrical installations will be installed along the same lines as for the Central Telephone Office to allow the smooth implementation of maintenance work.

- Mains and power wiring
- Lighting equipment/socket outlets
- Automatic fire alarm system
- Telephone conduit system
- Earthing system

Since the West Telephone Office will be staffed by maintenance personnel only during the day and the Airport Telephone Office will be unmanned for most of the time, on the fire alarm systems at these telephone offices, measures should be taken to allow the alarms to be communicated to the monitoring unit at the base station (Central Telephone Office).

2) Water Supply/Drainage and Sanitary Installations

(a) Water Supply Installations

The municipal water supply, which is not suitable for drinking, will be used for miscellaneous purposes. The system for water supply at the Central Telephone Office, determined with considerations for the scale of the facilities, frequency of use, operational characteristics and facility of maintenance, will be as follows. Water will be taken in from the main supply pipes of the municipal waterworks, and will be fed via the concrete reception tank and pump to the elevated water tank, whence it will be supplied to the required points via a gravitational water-supply system. The elevated water tank could be made of steel plates or fibre-reinforced plastic (FRP). A prefabricated FRP tank will be used here to facilitate its transportation and installation.

The West Telephone Office will be provided with the same system as that used at the Central Telephone Office. The system envisaged for the Airport Telephone Office, in view of the absence of water supply mains in the vicinity, and in view of the scale of the building and frequency of its use, is as follows. Water supplied regularly by tank lorries will be stored in an FRP reception tank, whence it will be supplied to the required outlets under pressure via a water supply pump.

(b) Hot Water Installations

Electric heaters will be provided for supply of hot water in the kettle rooms at the Central Telephone Office.

(c) Drainage Installations

Sewage (sewage treated in treatment tanks), gray water and rain water in the city of Phnom Penh flow together and directly into the conduits buried underground and are discharged without terminal treatment into the Mekong. At the Central Telephone Office, separate systems of indoor drainage pipes will be used for the ground floor and for the parts from the first floor upwards, and sewage and gray water will also be separated. In the piping outside the building, the sewage will join the gray water after passing through the treatment tank. The combined sewage/gray water will then be discharged under pressure via a drainage pump into the sewer mains. The same system will be used at the West Telephone Office.

At the Airport Telephone Office, since there are no sewer mains in its vicinity and the volume of domestic wastewater from the building will be small, the combined drainage, consisting of sewage treated in an outdoor treatment tank and gray water, will be discharged under pressure via a sewage pump into the nearest reservoir.

For the treatment tanks, aeration treatment tanks (FRP tanks; target biochemical oxygen demand [BOD]: 90) will be used at all three telephone offices.

(d) Sanitary Instruments and Installations

The toilets will be provided with sanitary equipment, such as wash basins and closets, as well as accessory items, such as mirrors, toilet racks, and toilet roll holders. The stools at the Central Telephone Office will be Western-style, while those at the West and Airport telephone offices will be Asian-style.

(e) Indoor Fire Hydrants

Fire hydrants will be installed at strategic points in the Central Telephone Office building for extinguishing fires in the building.

(f) Fire Extinguishers

Fire extinguishers will be installed at all three telephone offices. Types and capacities of the fire extinguishers will be determined in accordance with the possible sources of fire (ordinary combustibles, flames, electrical equipment, hazardous materials etc.), and they will be installed at positions facilitating extinction of fires at early stages.

(g) Piping Materials

Hard vinyl chloride piping will be used for water supply and drainage out of considerations for corrosion-proofing, facility of installation and economy. For outdoor drainage, either centrifugal reinforced concrete pipes (Hume pipes), which are normally used in Phnom Penh, or hard vinyl chloride pipes will be used. For supply and drainage of humidification water on the air-conditioning system for the switching equipment room, carbon steel pipes (galvanized steel pipes) will be used for reasons having to do with hazard prevention.

3) Air-Conditioning and Ventilation Installations

(a) Air-Conditioned Rooms and Air-Conditioning Load

The rooms to be air-conditioned and the human and equipment-generated heat load used for the design calculations will be as follows.

Human and Equipment-Generated Heat Load

(Central Telephone Office)

Floor	Room	Human (persons)	Equipment (kVA)	Remarks
Ground	Lobby/customer services office	30		
First	Switching equipment room	2	25.5 (86.4)	Throughout year w/ spare unit
	T/R equipment room	2	2.9 (8.4)	
	Control equipment room	2	2.1 (3.5)	
	MDF/test board room	4	2.0	
	Administration office	6		
	Director's room	2		
	Spare room	6		
Second	Manual S/W room	30	2.4	
	Instructors room	3		
	Meeting room	18		
	Bedroom	4		

\*NB: The values in brackets for the equipment-generated load are the ultimate values. The air-conditioner capacities are determined on the basis of the initial values. (The same applies in the tables below.)

(West Telephone Office)

Floor	Room	Human (persons)	Equipment (kVA)	Remarks
Ground	Machinery room	2	15.7 (34.9)	Throughout year w/ spare unit

(Airport Telephone Office)

Floor	Room	Human (persons)	Equipment (kVA)	Remarks
Ground	Machinery room	2	4.9 (12.6)	Throughout year w/ spare unit

(b) Target Temperature and Humidity

The design outdoor temperature/humidity conditions and the target indoor temperature/humidity conditions, determined on the basis of past meteorological data and the environmental conditions required for telecommunications equipment, are as follows.

(Outdoor temperature/humidity)

Dry-bulb temperature	:	36.7°C
Relative humidity	:	69%

(Indoor temperature/humidity)

- Switching equipment room

Dry-bulb temperature	:	27.0°C
Relative humidity	:	50%

- Office rooms, manual S/W room

Dry-bulb temperature	:	26.0°C
Relative humidity	:	50%

- Power room

Dry-bulb temperature	:	45.0°C
----------------------	---	--------

(c) Daily Air-Conditioning Periods

Switching equipment room	:	24 hours
Manual S/W room	:	24 hours
Office rooms	:	10 hours

(d) Air-Conditioning Systems

The air-conditioning systems selected will be systems that are easy to operate and maintain. In view of the importance of the telecommunications equipment installed in it, the switching equipment room will be provided with a spare unit with a capacity corresponding to 50% of the total capacity required (two units in permanent use). The air conditioners will be of the air-cooled type and will be used solely for cooling. The types of systems used will be determined according to the types and uses of the air-conditioned rooms. The systems to be used at the Central Telephone Office are listed below together with the rooms in which they are to be installed.



Classification of Air-Conditioning Systems

System	Room	Remarks
Floor-type	Switching equipment room Lobby/customer services office MDF/test board room Manual S/W room	Throughout year, w/ 1 spare unit
Ceiling/exposed	Control equipment room	
Ceiling cassette	Administration office Director's room Spare room Bedroom Instructors room Meeting room	

At the West and Airport telephone offices, only the machinery rooms will be provided with air conditioning, and the systems used will be selected on the same principles as at the Central Telephone Office.

(e) Ventilation Installations

Ventilation installations will be provided in rooms subject to generation of heat, dust, odor and humidity. The rooms to be provided with ventilation at the Central Telephone Office are listed in the table on the following page together with the air exchange rates and ventilation methods.

Air Exchange Rates and Ventilation Methods

Room	Exchange Rate	Ventilation Method	Remarks
Cable chamber	3 times/hour	Type 1 ventilation	40 min. every 12 hours
Power room	5 times/hour	Type 1 ventilation	Recharge signal operation, thermostat operation
Generator room	5 times/hour	Type 3 ventilation	Thermostat operation
Toilets	10 times/hour	Type 3 ventilation	
Kettle rooms	5 times/hour	Type 3 ventilation	
Storerrooms	5 times/hour	Type 3 ventilation	

NB: Type 1 ventilation: mechanical supply and exhaust  
 Type 3 ventilation: natural supply and mechanical exhaust

(f) Ceiling Fans

Fixed ceiling fans will be provided in appropriate numbers corresponding to the number of persons accommodated in the following habitable rooms, which will not be provided with air conditioning.

Ground floor: service order/OSPM room, guard room (ancillary building - 2)

First floor : T/R staff room, S/W staff room

Second floor : collecting office, billing center, customer premises equipment repair room, classrooms

(5) Interior/Exterior Finish Plan

Besides having a high level of durability, the materials used on the exterior of the telephone office buildings should be expressive of modernity, reliability and sharpness. They must, on the other hand, be materials that can be handled by local subcontractors, and economic factors too must be taken into account.

In accordance with these considerations, sprayed ceramic paint will be used on the exterior of the principal parts, while the windows on the exterior walls will be provided with aluminum sash. Fire-protection shutters will be installed on the outer side of the window sashes for machinery-related rooms. The roof will be flat, with trowel-finished covering concrete on asphalt waterproofing. The entrance porch and the entrance to the lobby will be provided sheet metal-finished canopies.

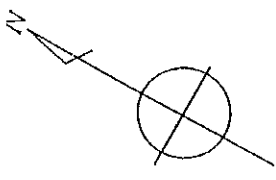
On the interior of the building, terrazzo tiles will be used for flooring in the lobby and the entrance hall, which are used by people with wet feet. Acid-proof vinyl tiles will be used in the power room, while ordinary vinyl tiles will be used in habitable rooms to prevent generation of dust. Mortar and emulsion paint will be used on the walls and rock-wool acoustic boards on the ceilings of rooms other than the equipment stores and air-conditioning machinery rooms (ACMR's). These are all finishing materials which are in general use. Rooms

where water is used (toilets, kettle rooms etc.) will be provided appropriate finishing.

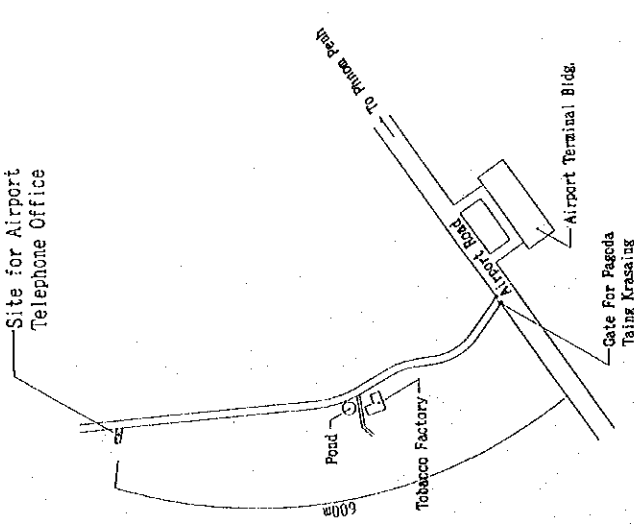
(6) Basic Design Drawings

The following basic design drawings are given on the following pages.

- 1) Project Site Location Map
- 2) Central Telephone Office - Removal Plan
- 3) Central Telephone Office - Site Layout Plan
- 4) Central Telephone Office - Ground Floor Plan
- 5) Central Telephone Office - First Floor Plan
- 6) Central Telephone Office - Second Floor Plan
- 7) Central Telephone Office - Roof Plan
- 8) Central Telephone Office - Elevation - 1
- 9) Central Telephone Office - Elevation - 2
- 10) Central Telephone Office - Section
- 11) Central Telephone Office -Generator House
- 12) Central Telephone Office - Guard House
- 13) West Telephone Office - Site Layout Plan & Floor Plan
- 14) West Telephone Office - Elevation & Section
- 15) Airport Telephone Office - Site Layout Plan & Floor Plan
- 16) Airport Telephone Office - Elevation & Section

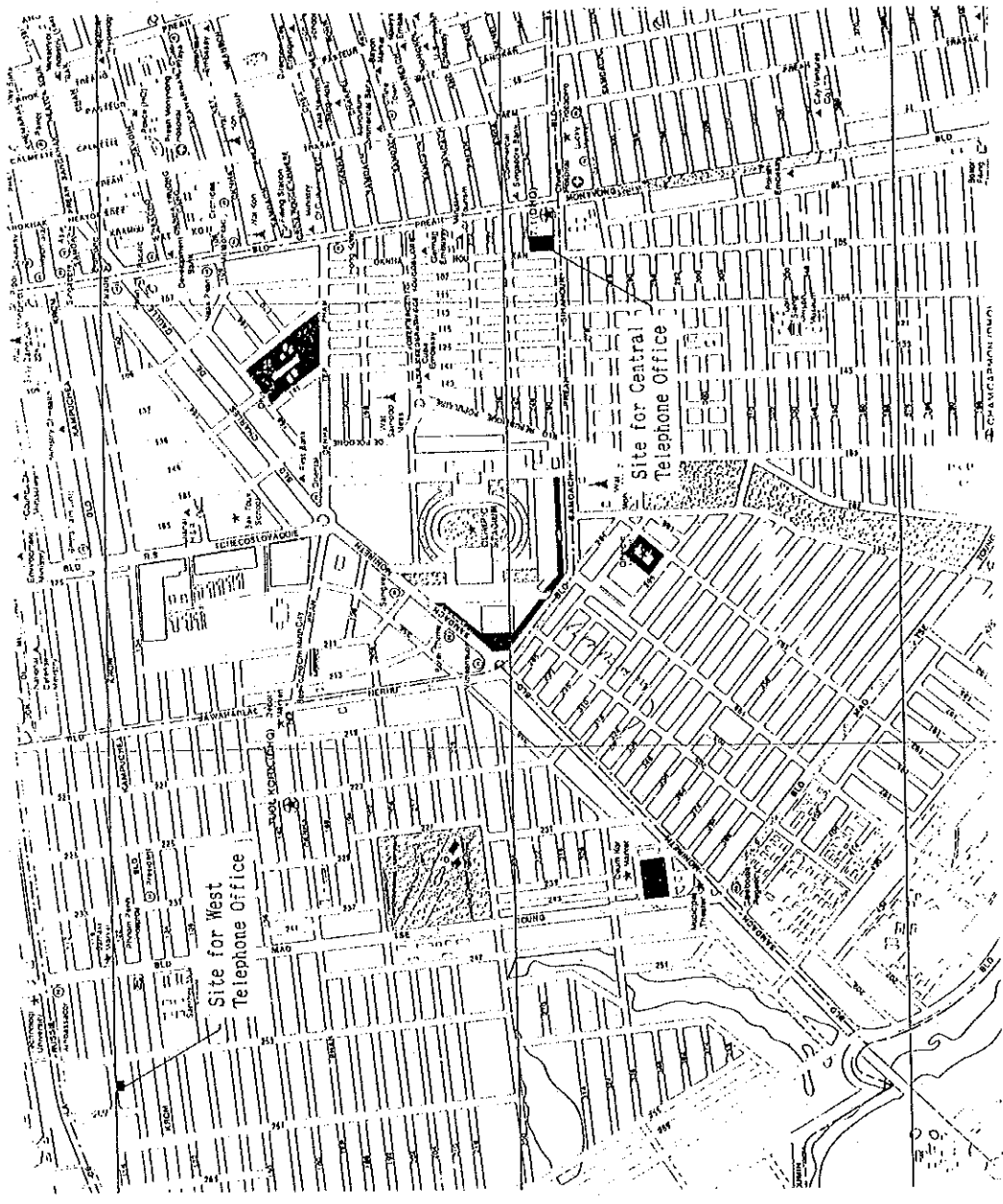


Site for Airport Telephone Office

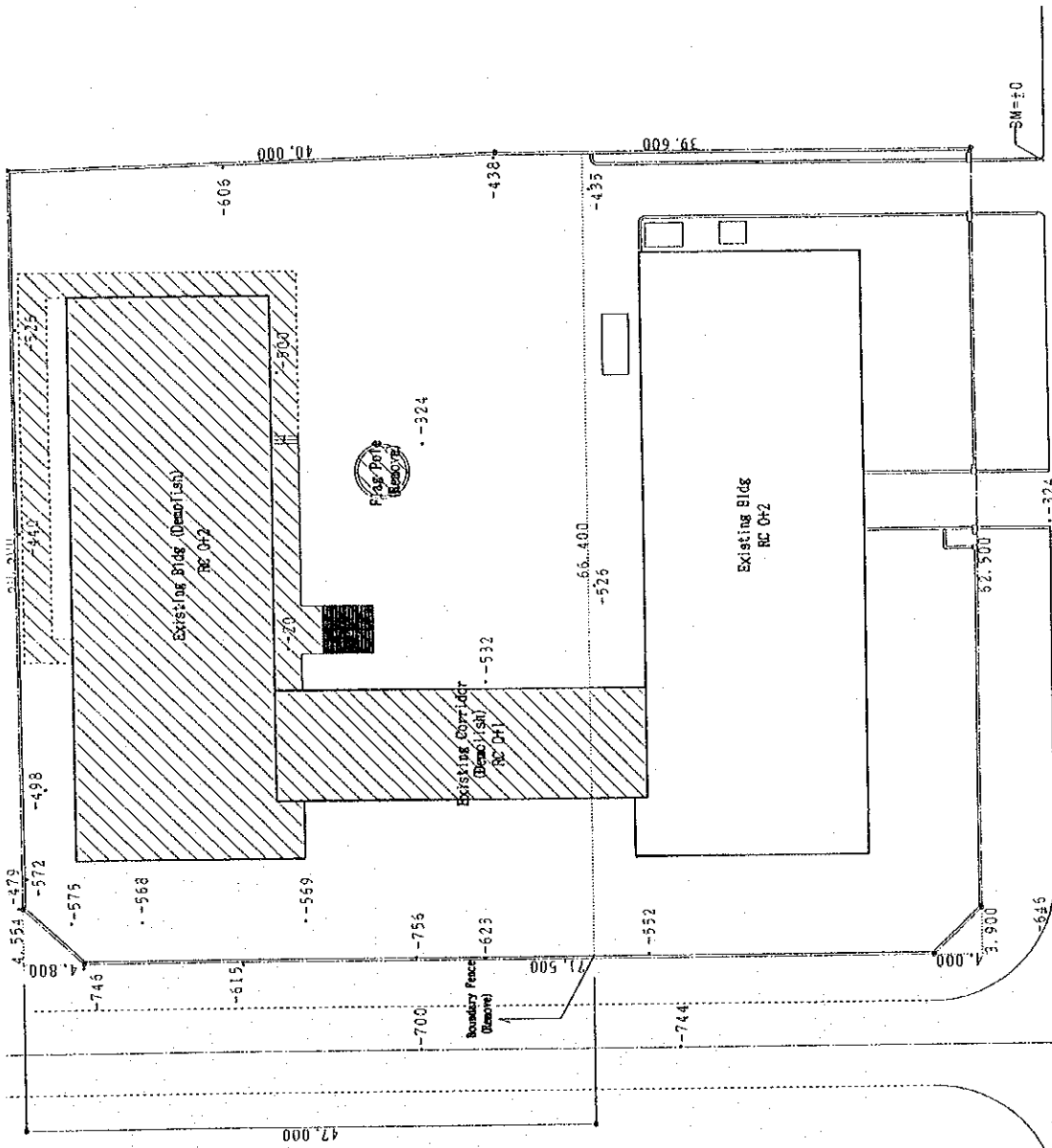
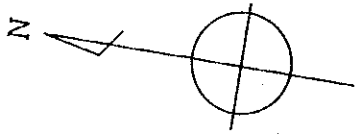


Phum Peah International Airport

Airport Telephone Office



Central Telephone Office & West Telephone Office



CENTRAL TELEPHONE OFFICE  
REMOVAL PLAN 1/400

BASIC DESIGN DRAWING (3)

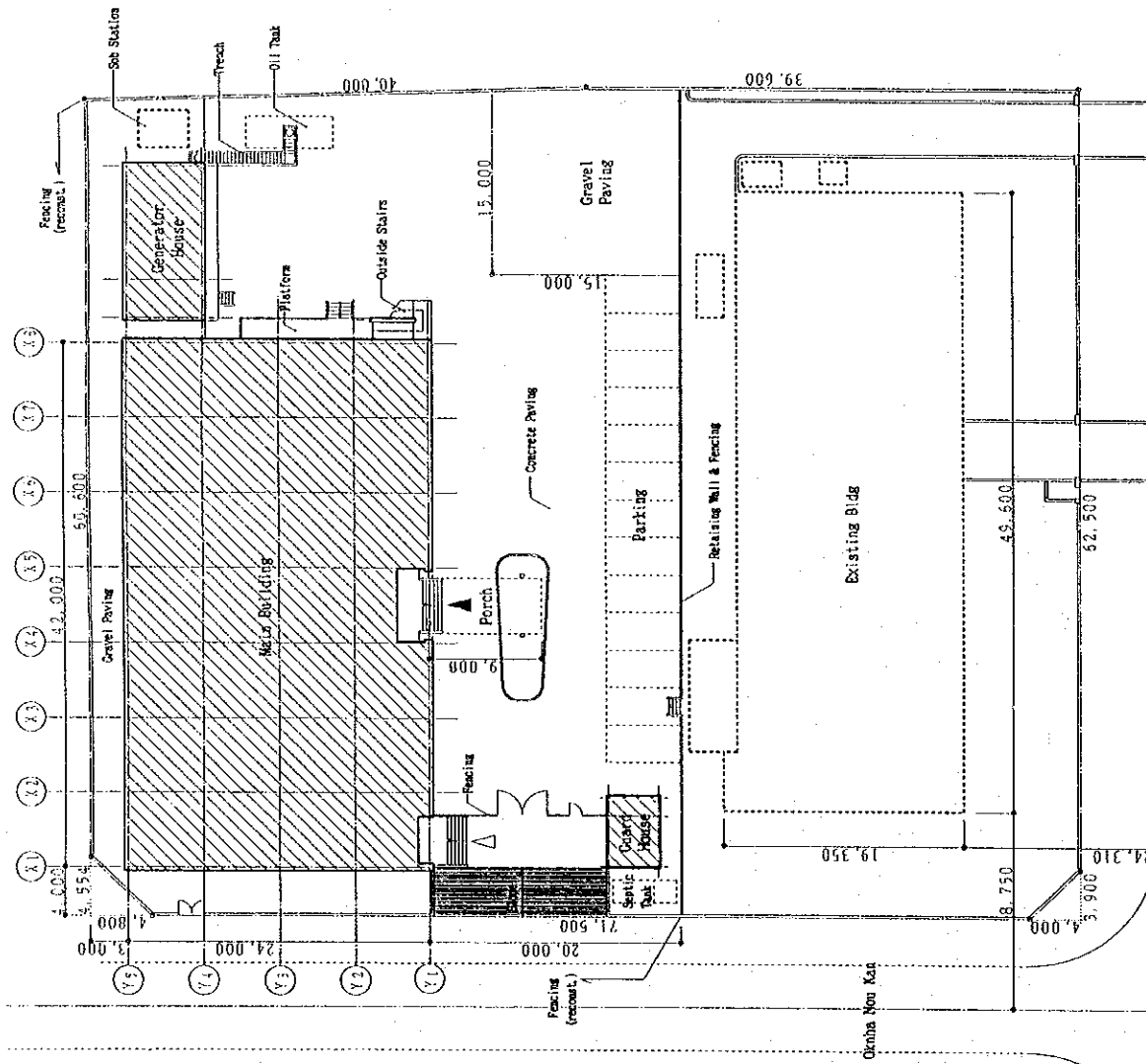
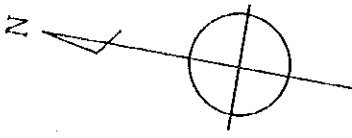


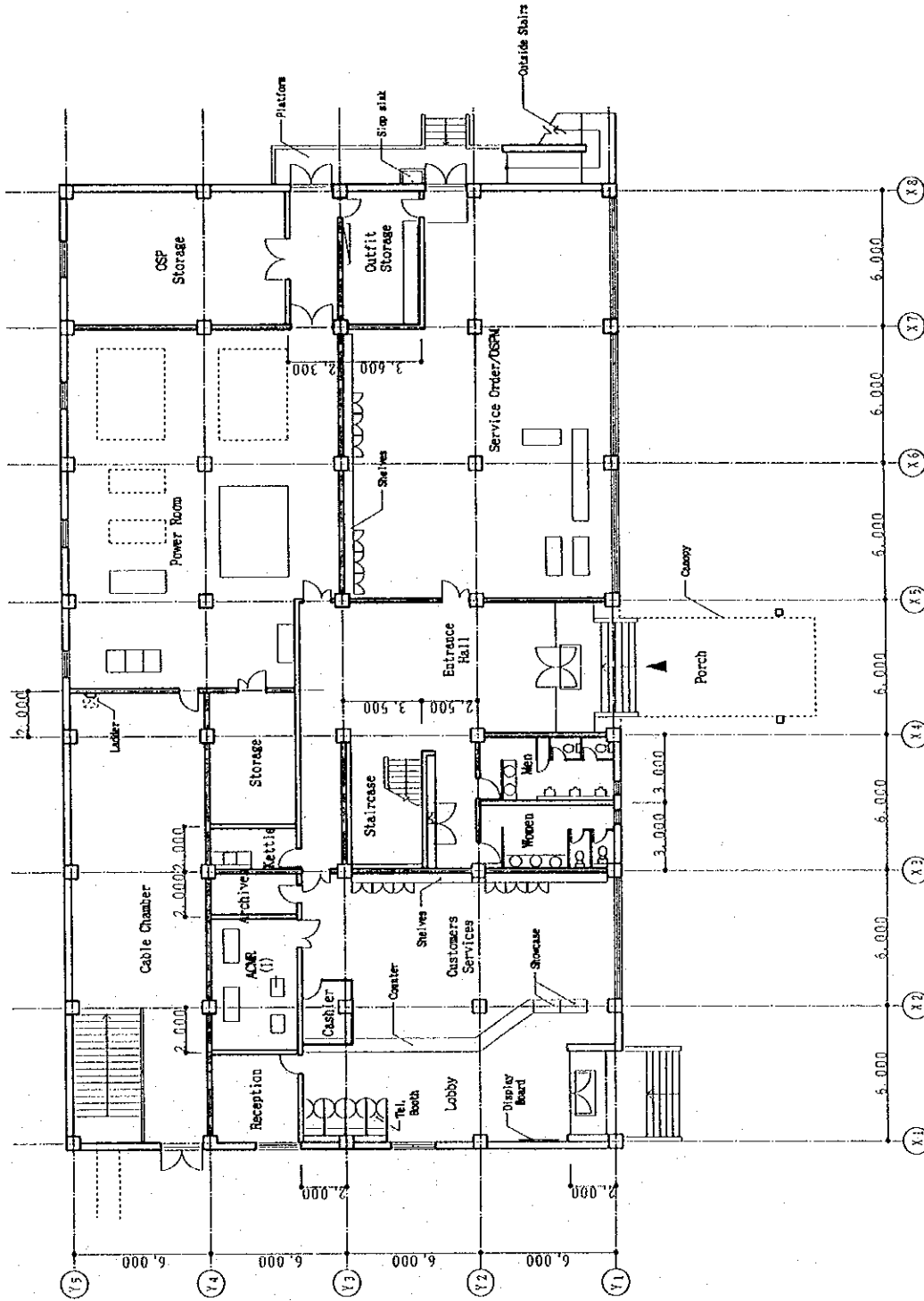
Table of Floor Areas

Main Bldg	Ground F	1,041.25
	1st F	1,041.25
	2nd F	1,041.25
	Pent	40.32
	Total	3,164.07
Generator House		97.47
Guard House		22.00
Grand Total		3,283.54 m <sup>2</sup>

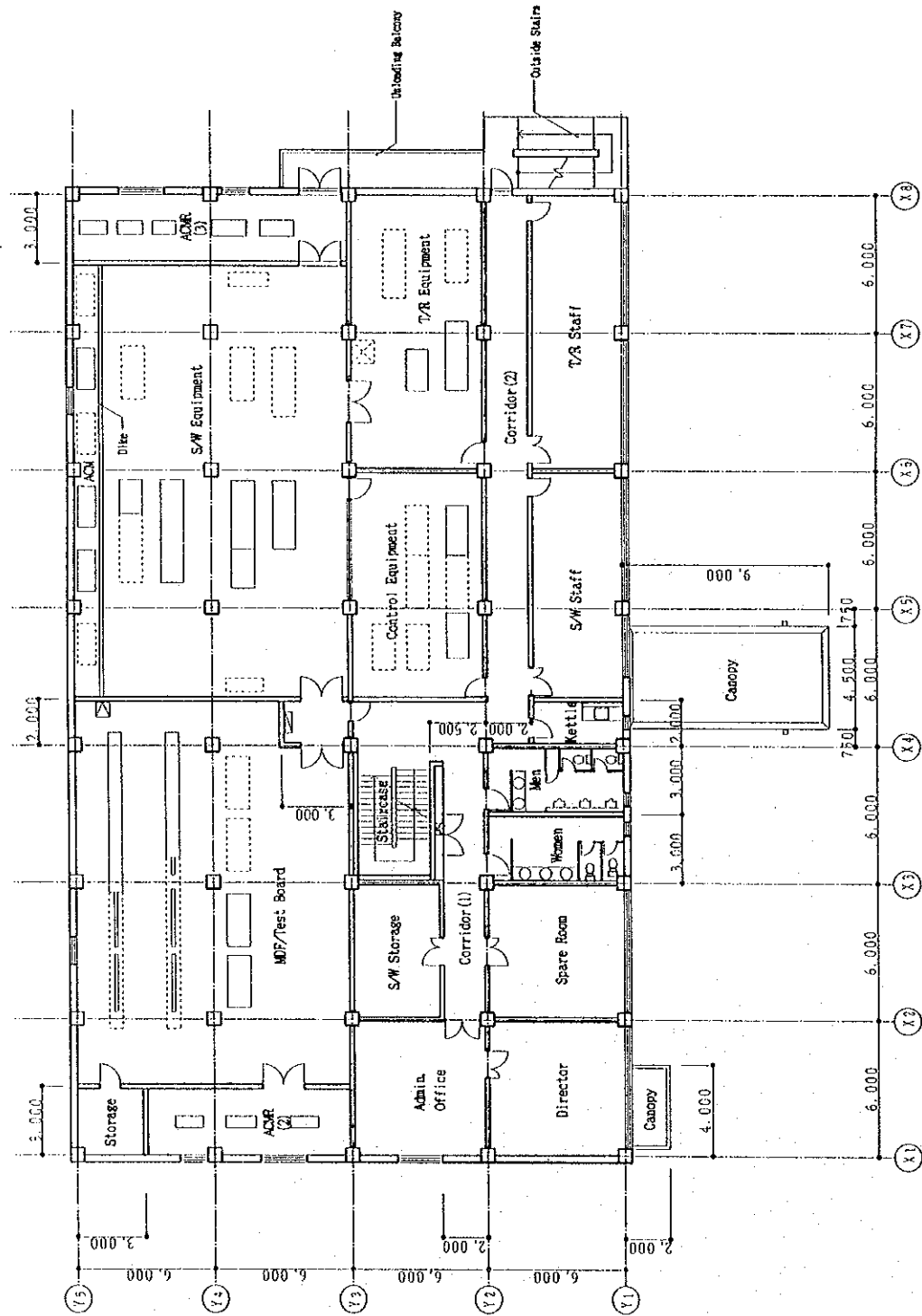
B/L. Sandeep Prash Sihanout

CENTRAL TELEPHONE OFFICE

SITE LAYOUT PLAN 1/400

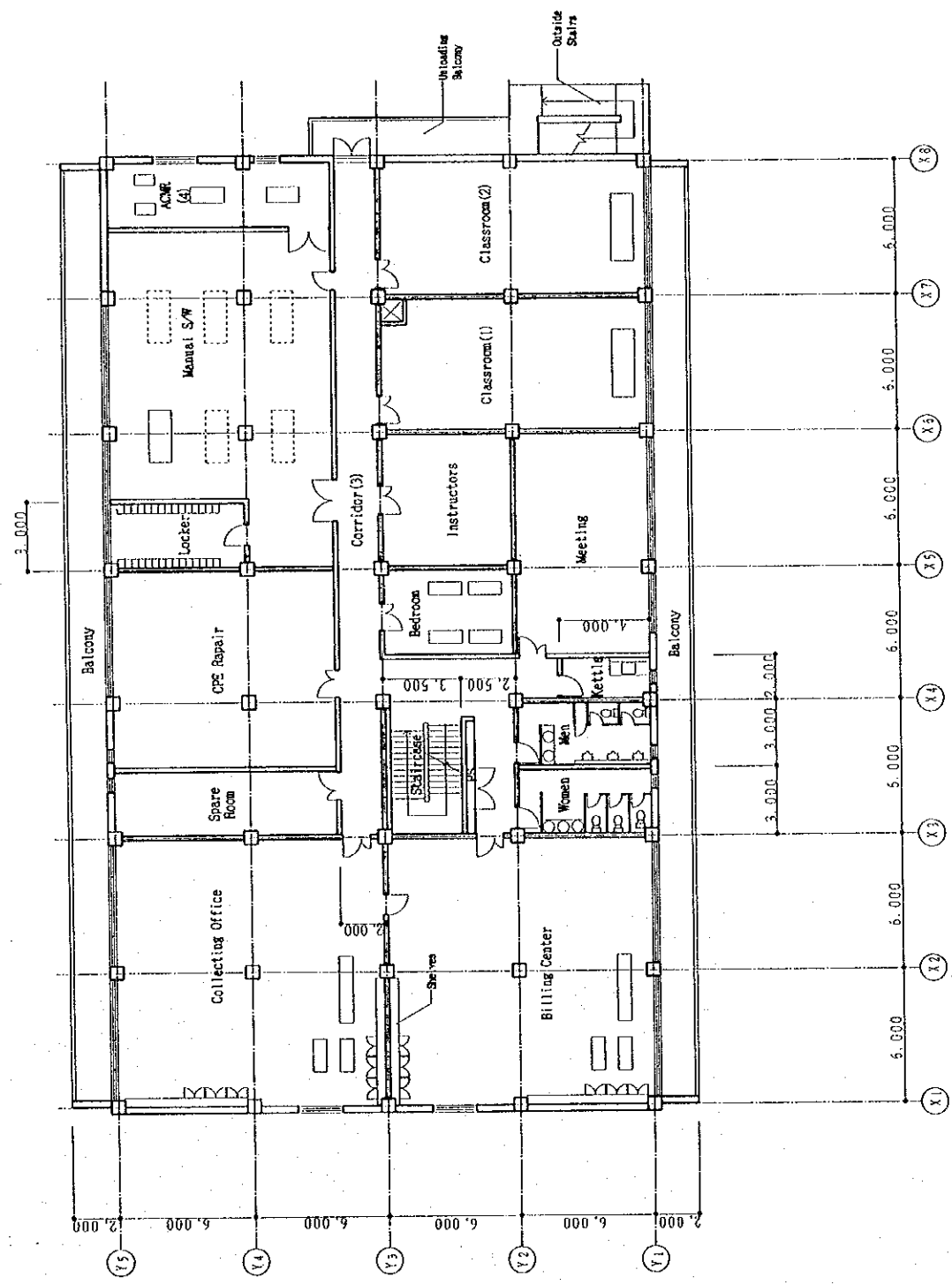


GROUND FLOOR PLAN

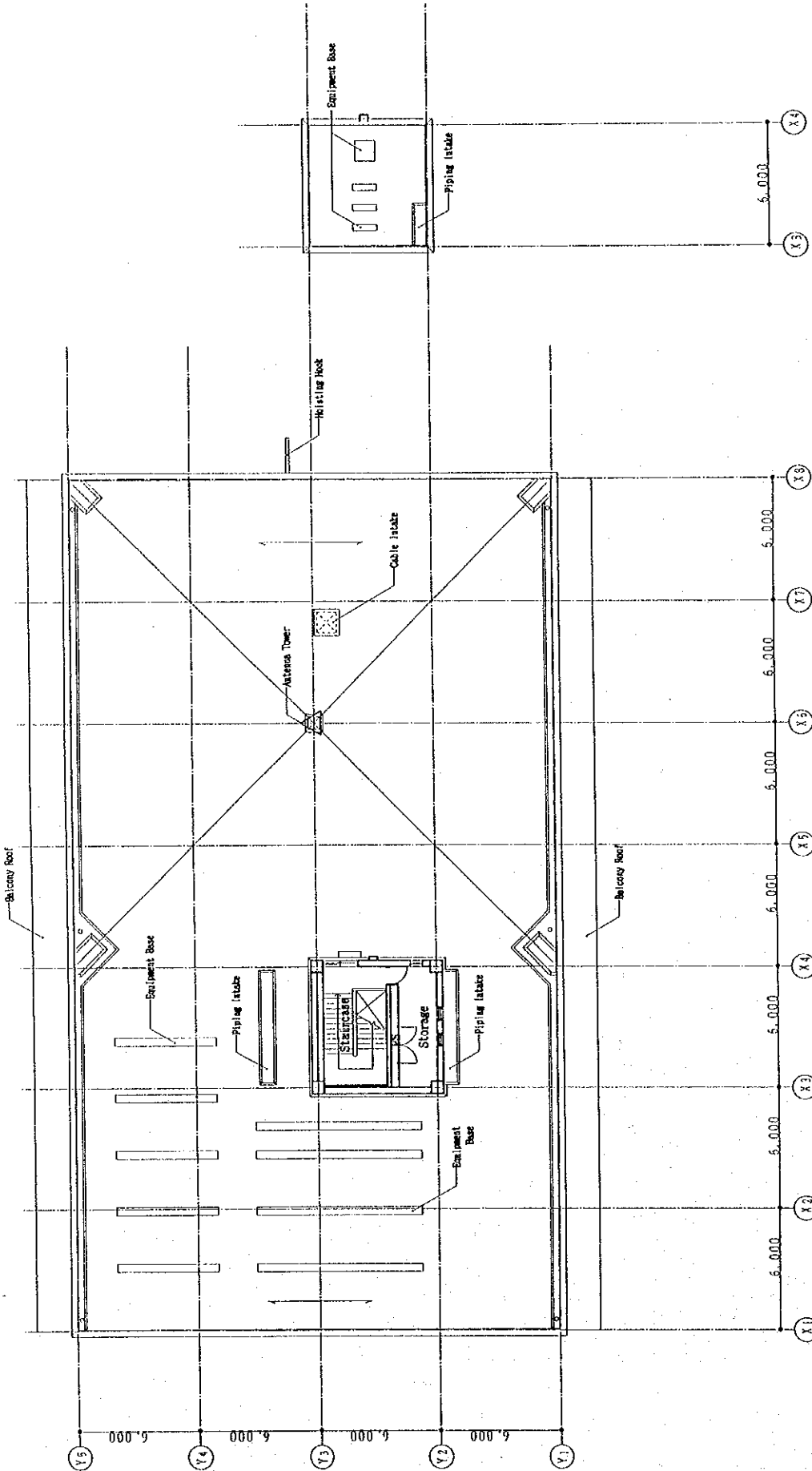


1ST FLOOR PLAN



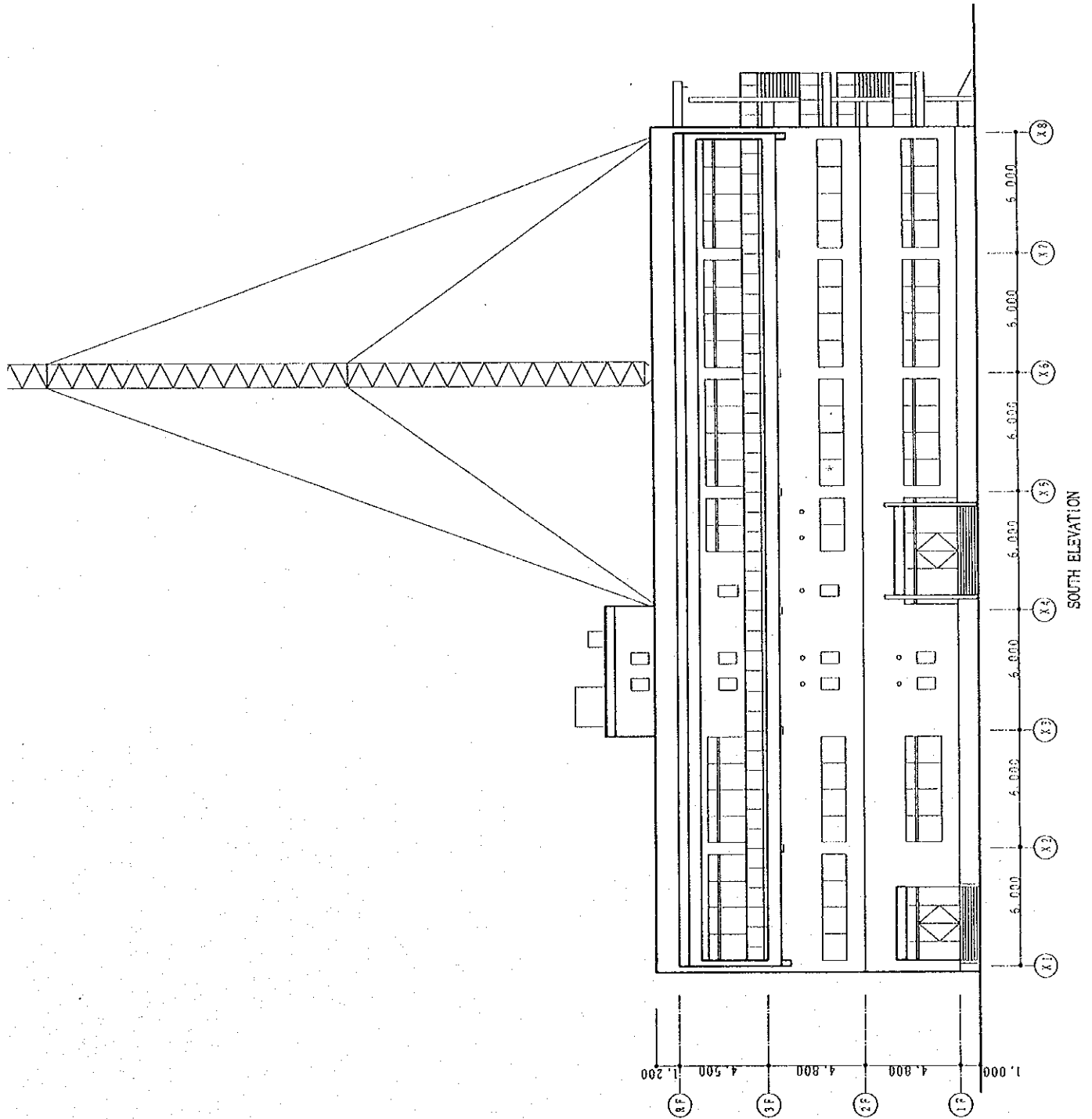


2ND FLOOR PLAN

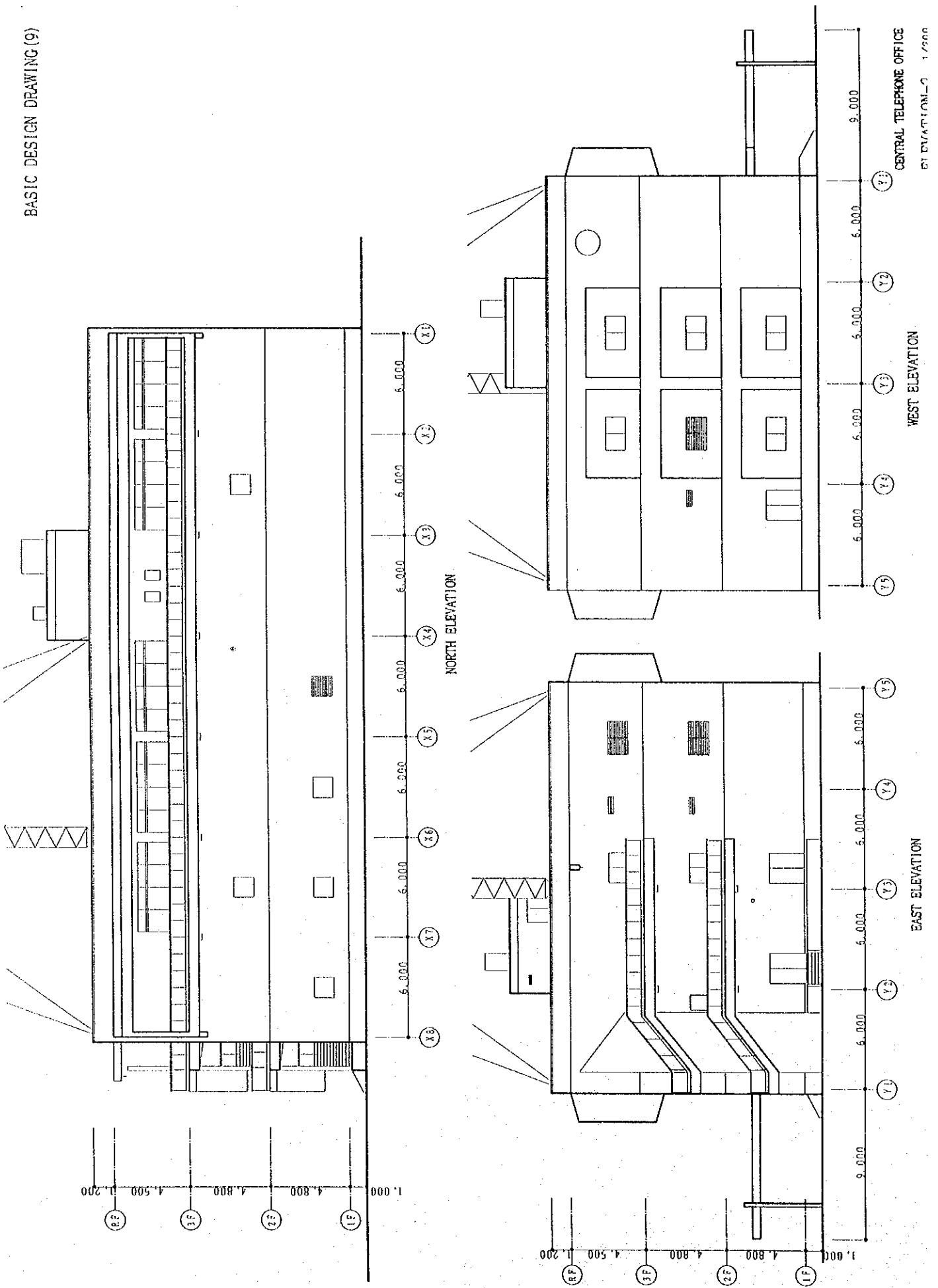


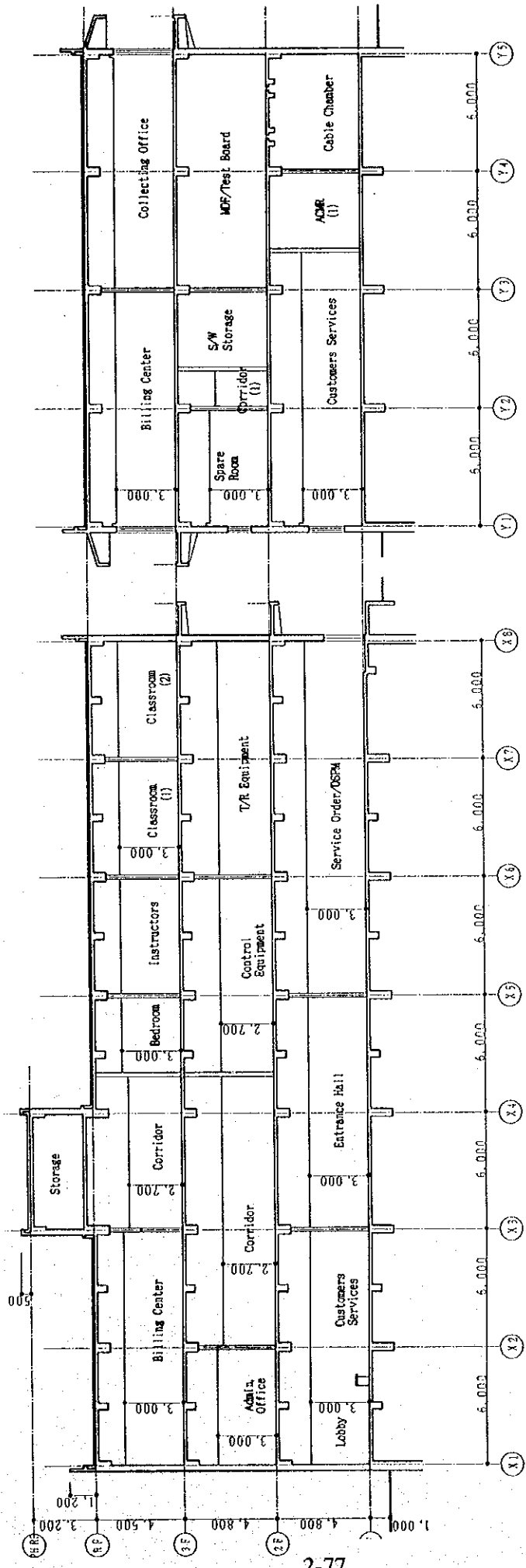
PENTHOUSE ROOF

ROOF PLAN



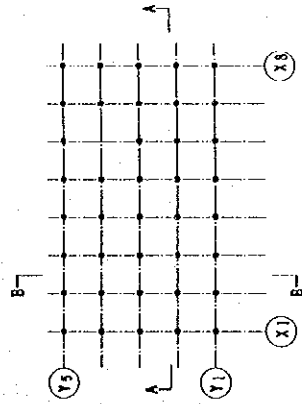
BASIC DESIGN DRAWING (9)

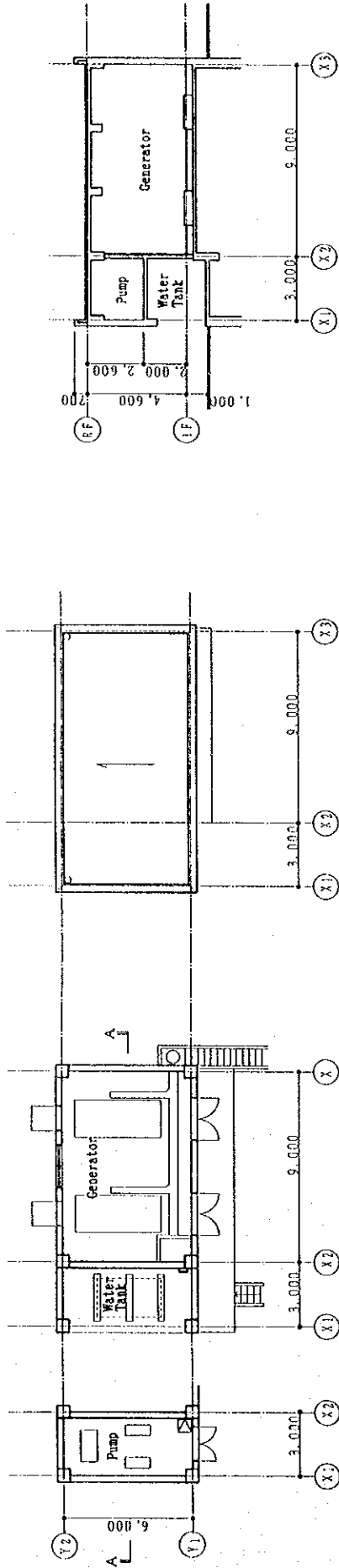




B-B SECTION

A-A SECTION



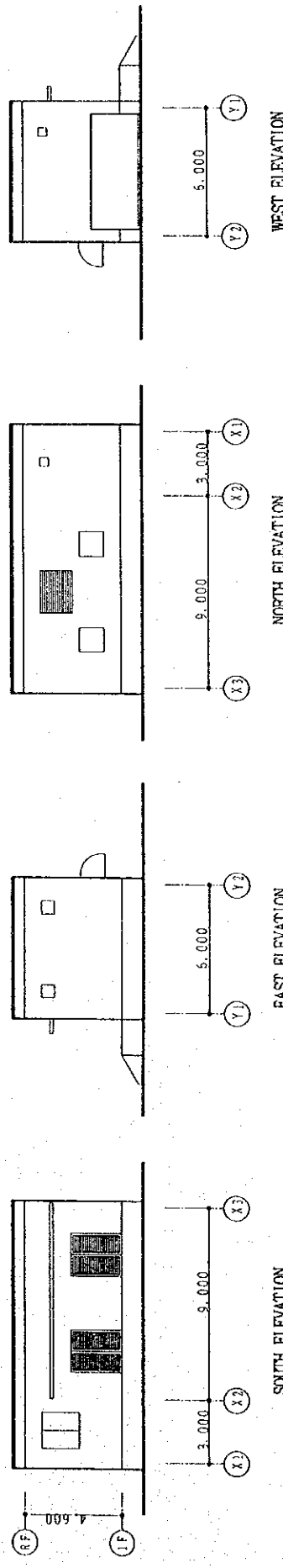


A-A SECTION

FLOOR PLAN

FLOOR PLAN

MEZZANIN PLAN

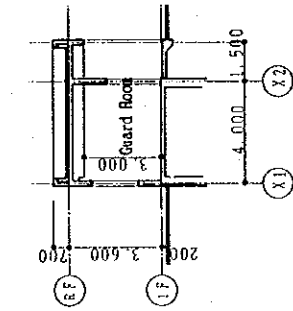


WEST ELEVATION

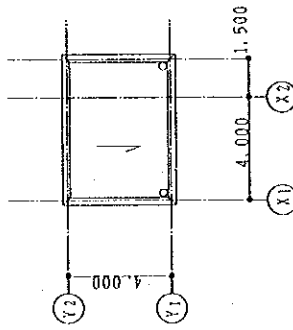
NORTH ELEVATION

EAST ELEVATION

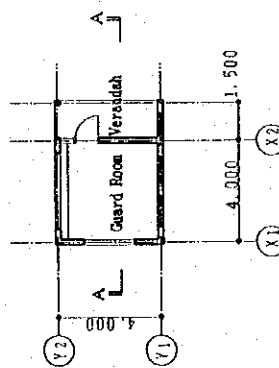
SOUTH ELEVATION



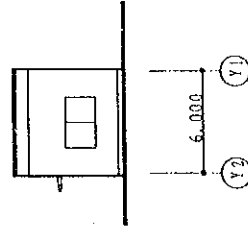
A-A SECTION



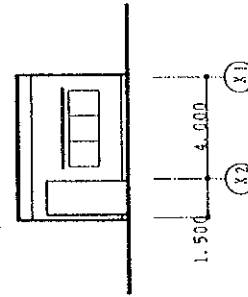
ROOF PLAN



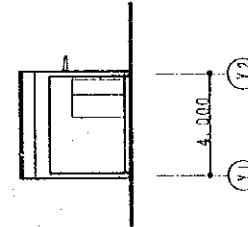
FLOOR PLAN



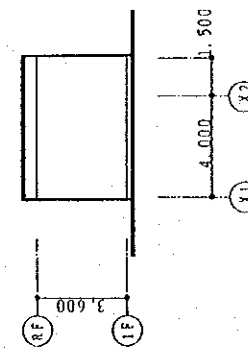
WEST ELEVATION



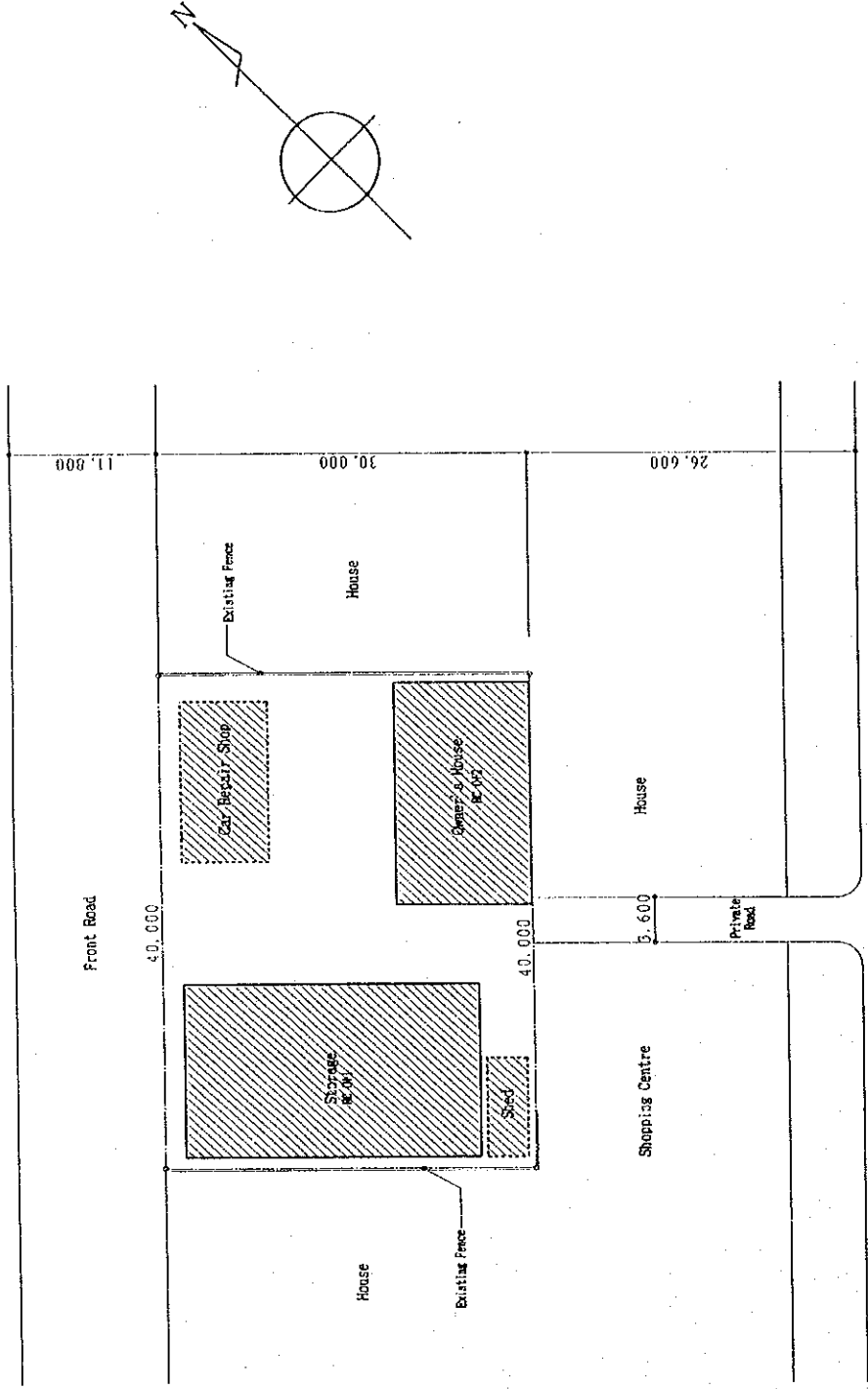
NORTH ELEVATION



EAST ELEVATION



SOUTH ELEVATION



Bld Kampuchea Xroa



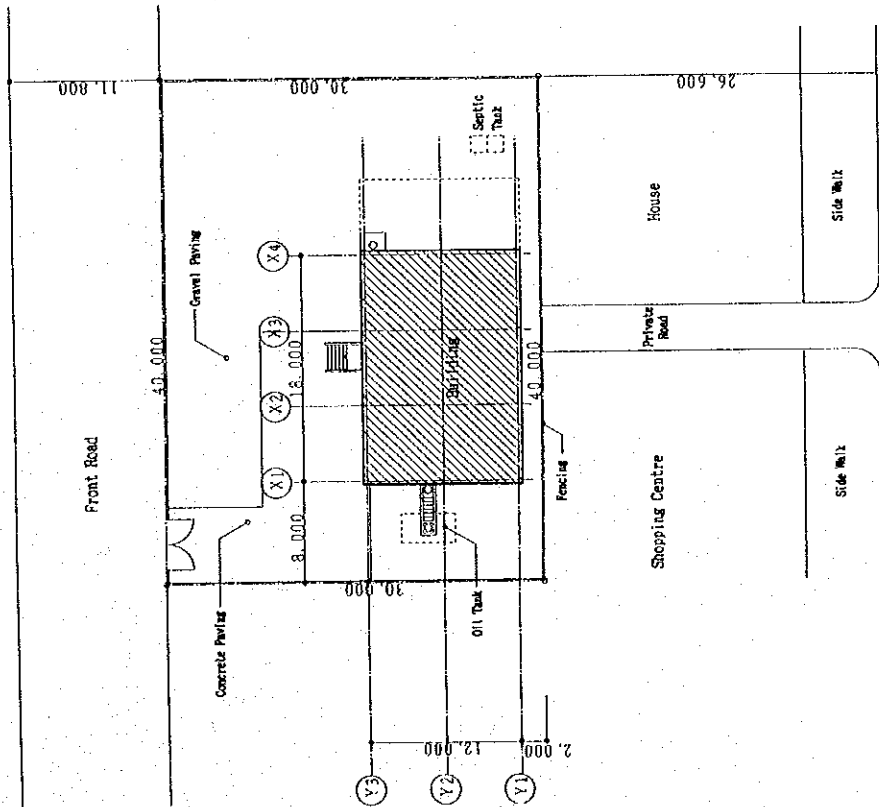
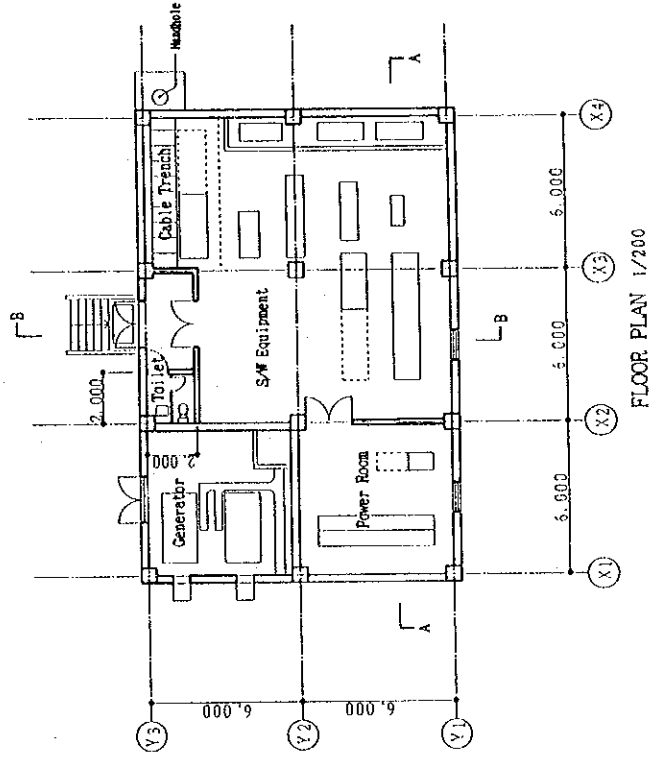
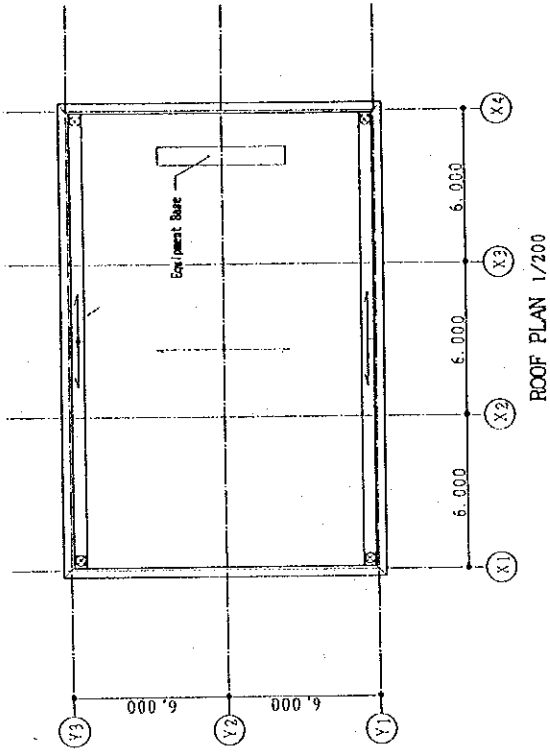
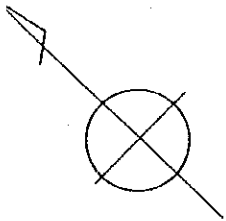
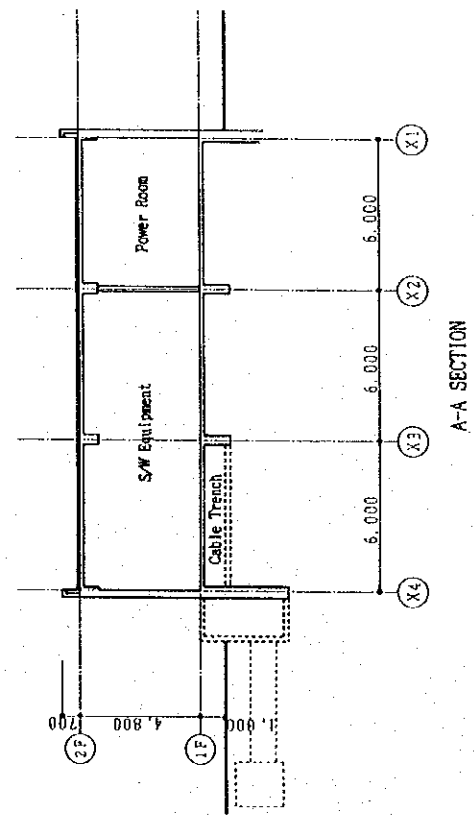
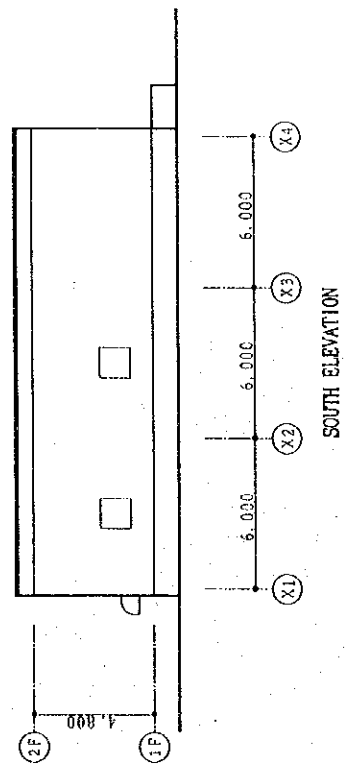
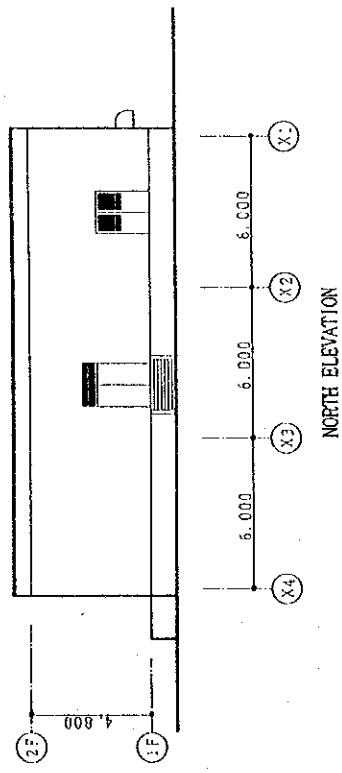
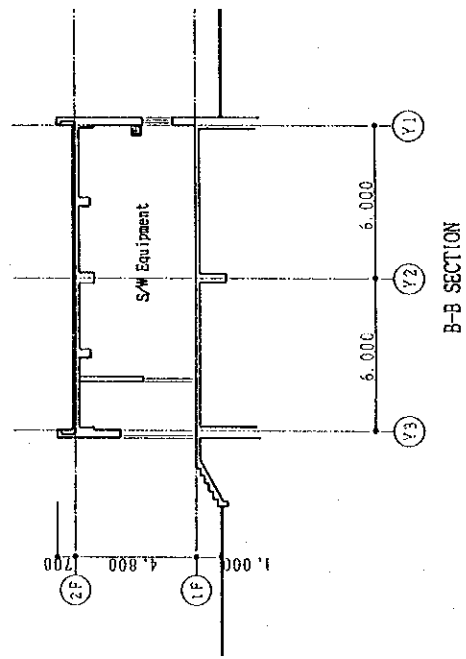
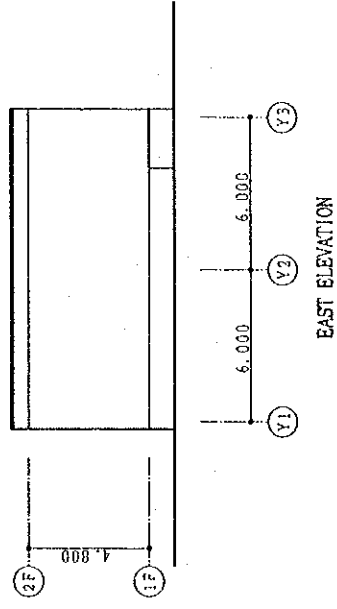
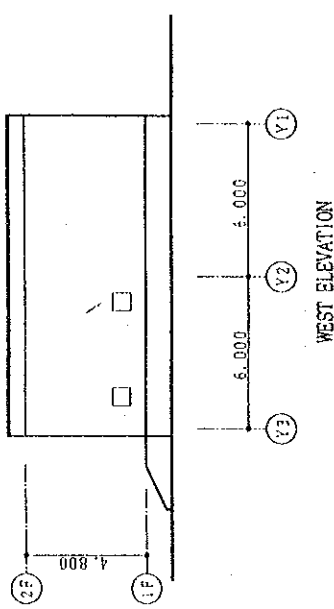


Table of Floor Area	
Building	225.62 m <sup>2</sup>

WEST TELEPHONE OFFICE  
SITE LAYOUT PLAN & FLOOR PLAN

BASIC DESIGN DRAWING (15)



WEST TELEPHONE OFFICE

ELEVATION & SECTION 1/2000

BASIC DESIGN DRAWING (16)

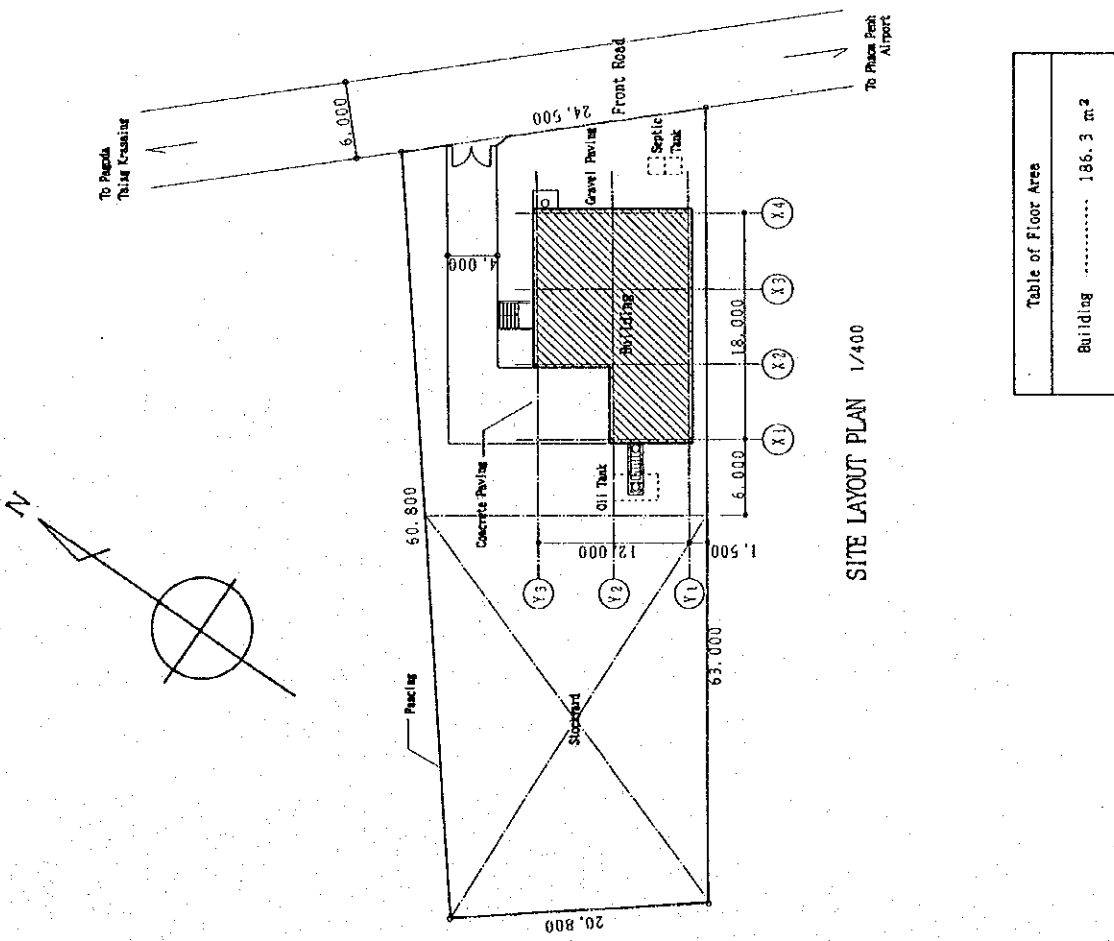
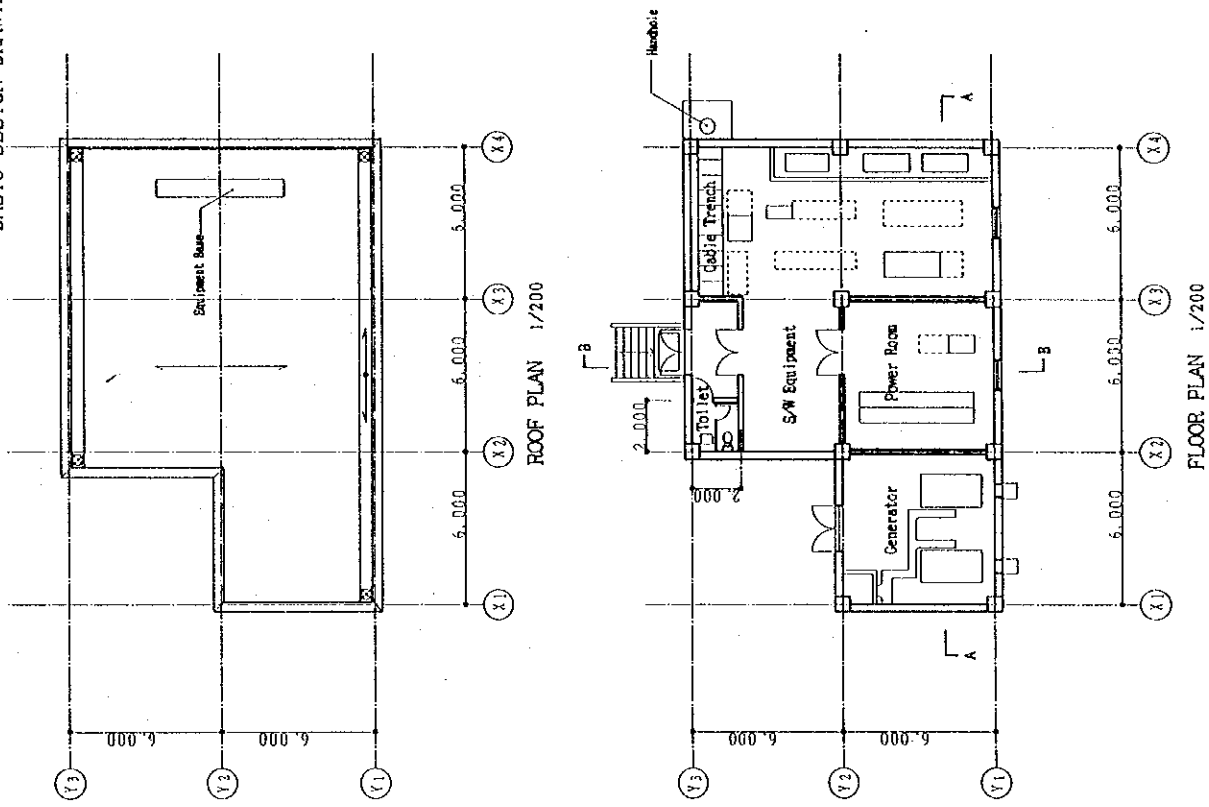
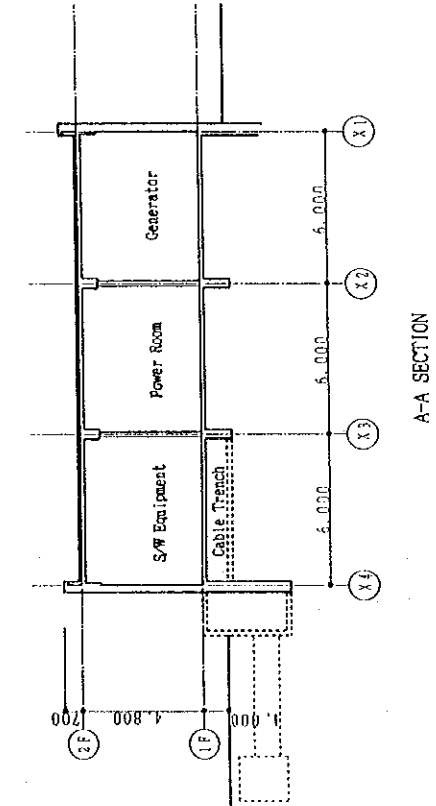
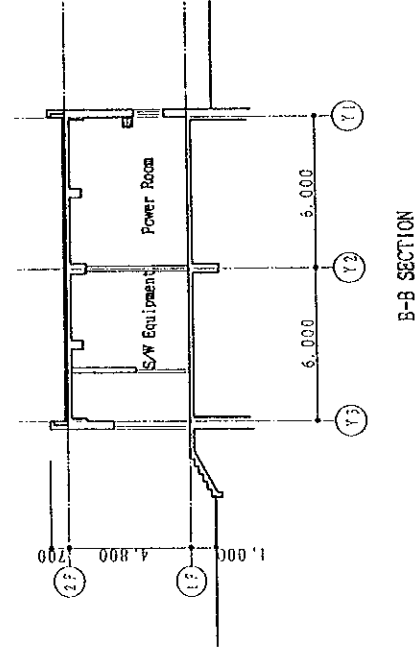
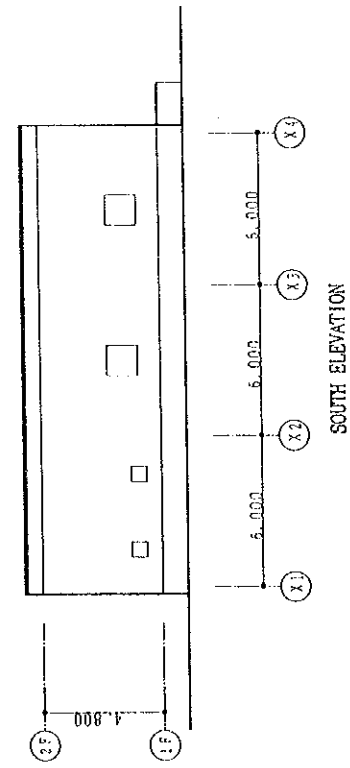
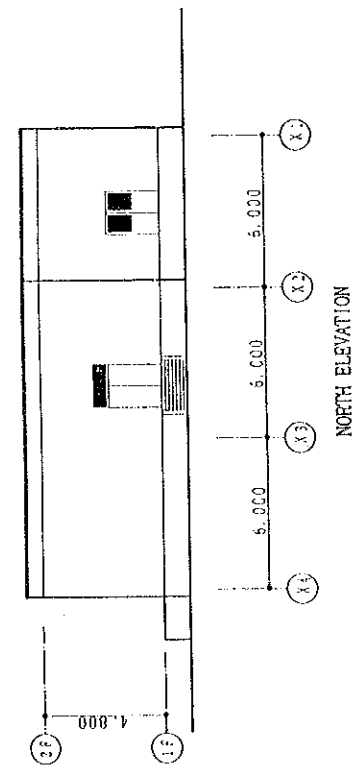
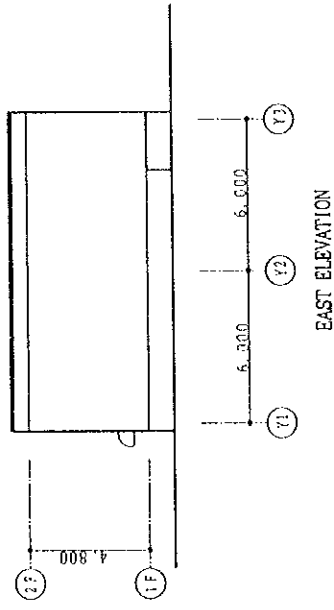
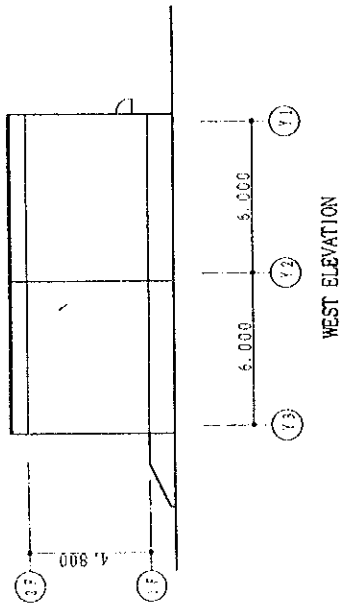


Table of Floor Area	
Building	186.3 m <sup>2</sup>



AIRPORT TELEPHONE OFFICE

ELEVATION & SECTION 1/200

**CHAPTER 3**  
**Implementation Plan**



CHAPTER 3. IMPLEMENTATION PLAN

3-1 Implementation Plan

3-1-1 Implementation Concept

The MPTC is the executive agency which is primarily responsible for the implementation of the Project. In order to carry out the Project smoothly and without any delays, the MPTC should properly manage the Project implementation so that mismanagement does not arise among the parties concerned, particularly with respect to the implementation schedules and implementation particulars pertaining to each area of responsibility.

Therefore, it is suggested that the formation of the Project implementation as shown in Figure 3.1 is established within the MPTC.

Prior to commencement of the construction work, the MPTC will select a project manager and other engineers as counterparts who will work together with the consultant to review the various individual work schedules as well as technical specifications for respective systems, to make necessary report to the persons (organizations) concerned in both countries, to make appropriate guidance to the contractor and to adjust the overall project implementation. Through the Project implementation, the MPTC staff will be able to obtain maximum technology transfer from the consultant and contractors who should have sufficient knowledge for the management of the Project and the method of installation and maintenance as well as knowledge of operation for all equipment/facilities to be introduced by the Project.

The telephone offices to be established under this project, and the Central Telephone Office in particular, are facilities of the highest importance as the central cores for the developing telecommunication network in the city of Phnom Penh. In addition to providing satisfactory working environments for the telephone office staff, the buildings must, upon their completion, satisfy the conditions required for the installation and operation of the telecommunications equipment which are to be accommodated in them. In the Construction of telephone office buildings, therefore, the following items must be taken into account.

(1) Considerations for Overlapping Schedule of Project

As the configurations of the bases for the roof-top pylons and the installation and wiring methods for the telecommunications equipment will vary according to the manufacturers' specifications for the equipment, there will be a need, even after the commencement of the construction work, for investigation and adjustment on a large number of items relating to the details of the buildings, such as the shapes of the equipment platforms, methods to be used in reinforcing the concrete for equipment installation, layout of various trenches, size, shape and position of openings in floors and walls, and the treatment of cable inlets.

Furthermore, the restrictions on the schedule arising out of the implementation of the project under grant aid from the Government of Japan necessitate the installation of some of the telecommunications equipment while the construction work is still in progress. Since this means that any delay in the construction work will have serious effects on the plans for the subsequent equipment installation work, strict adherence to the construction schedule will be of utmost importance. For these reasons, the contractor for the construction work must carry out adequate consultation and coordination with the contractor for equipment installation under the guidance of the consultant staff, while the contractor for the equipment installation work must make arrangements enabling them to stay in close contact with the contractor for the construction work.

The MPTC should, for their part, make the necessary arrangements for ensuring the smooth implementation of the work by appointing supporting staff with expertise in the fields of construction, communication engineering and communication equipment, by expediting the clerical work for the legal procedures required for the implementation of the construction work, and by making thorough preparations, for example, for explaining the construction work to the residents in the neighborhood of the construction sites.

(2) Use of Local Contractors

According to the Cambodian Ministry of Commerce, 53 companies have so far been registered with them as construction/engineering firms. There is no data, however, on the sizes and records of these companies, and the great majority of them are in fact no more than handlers of construction materials and small-scale



building firms established by investment from neighboring countries, such as Thailand, China and Vietnam. At the same time, construction materials available in Cambodia are limited to basic materials such as cement, gravel, sand and bricks. Under these circumstances, there are, unfortunately, virtually no local firms capable of carrying out by themselves the construction of medium or larger buildings involving the installation of various interior finish materials and mechanical and electrical equipment, neither are their capacities for construction management adequate for such purposes. As a result, the situation encountered in the majority of construction projects implemented under assistance from the Government of Japan and donor organizations in other countries is one in which the local construction firms participate mainly as providers of labor, while materials and skilled workers are procured in the donor or neighboring countries, and the projects are utilized as occasions for technology transfer to the local workers. It is expected that this type of setup will also apply to this project.

(3) Management Personnel Plan

1) Management Personnel Plan for Building Construction

- Phase I

The construction of the Central Telephone Office, envisaged under Phase I of the project, will involve piling work, as the site for the three-storied building is located on soft ground, and will, at the same time, have to be implemented under an extremely tight schedule, due to the need to begin equipment installation while the construction work is still in progress. An adequate number of management staff will, therefore, have to be stationed on site to ensure the required quality in the construction work and adherence to the construction schedule. The Japanese management team will consist of four members (field manager, building engineer, equipment engineer and clerical officer), all of whom will be permanently stationed on site throughout the duration of the construction work. In addition, in view of the specialized nature of the building as a telephone office involving a large number of items of miscellaneous metal work, such as coaxial cable ports and cable slots, and in view of the lack of experience on the part of local subcontractors in fitting and interior finish work, a skilled worker, with ample experience in metal and interior finish work in

general, will be dispatched to the site from Japan for a period of around four months during the finishing work to provide guidance in such work while ensuring the transfer of technology to local firms.

- Phase II

The West and Airport telephone offices, due for construction under Phase II of the project, are both relatively small single-storied buildings, with total floor areas of around 200 m<sup>2</sup>. While the two sites are separated by a distance of around 7 km, it is thought, in the light of the scales of these buildings, that there will be no need to provide separate Japanese management staff for the two sites, and it will suffice to provide a single three-member team (field manager, equipment engineer and clerical officer) covering both sites. There will be no need for dispatch of skilled workers from Japan under this phase of the project.

2) Management Personnel Plan for Installation of Telecommunications Facilities

Telecommunications network installed in the Project will be composed of sub systems such as exchanges, transmission equipment subscriber cables a radio subscriber system and power plants of which technologies are state-of-the-art. In the implementation of the Project, therefore, engineers who have sophisticated expertise and sufficient experience are required for the installation of each sub system. Each engineers will train the MPTC's employees to operate and maintain the facilities and equipment through the installations. The following engineers are planned to be dispatched:

- Phase I

Switching engineers	2 persons
Transmission engineers	3 persons
Power plant engineers	1 person
Cable engineers	10 persons

- Phase II	
Switching engineers	2 persons
Transmission engineers	3 persons
Power plant engineers	4 person
Cable engineers	10 persons
Radio engineers	5 persons
Tower engineers	4 persons

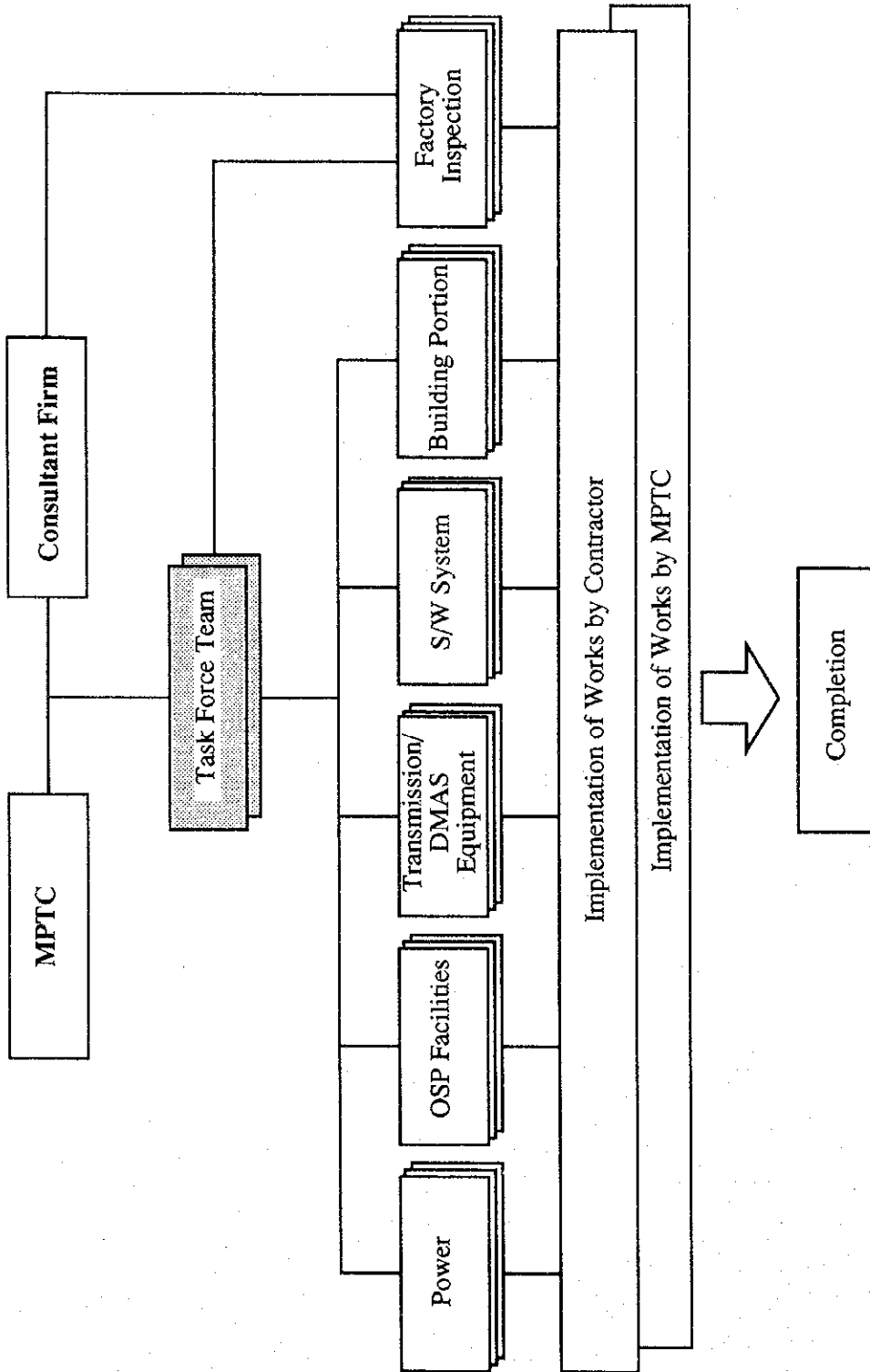


Figure 3.1 Formation of the Project Implementation

3-1-2 Implementation Condition

To smoothly realize the rehabilitation of public telecommunications facilities through the establishment of 3 exchanges in an efficient and economical manner, it is desirable that the portion of the Project which is under the responsibility of the Japanese portion be carried out by a selected contractor, covering all the works involved, i.e., survey, design, procurement of equipment/materials, and construction/installation.

For the works which require specific expertise, such as cable splicing, cable cutover, installation of switching/transmission equipment, power facilities, tests of various kinds of facilities, etc., technology transfer will be made to the MPTC staff in the form of on-the-job training by helping them as assistants to dispatched contractor's engineers. Since the equipment/facilities are to be introduced under the Project, training in operation and maintenance of new systems including a supervisory/control system is indispensable. Hence the dispatch of 1 or 2 contractor's engineers for Fiber Optic Cable, Switching, Transmission and Radio transmission respectively is necessitated.

Construction work for this Project is to be carried out on a complete turn-key basis by a contractor awarded through a competitive bidding in each respective phase.

Since the construction materials available in Cambodia are limited to the basic materials, it is expected that most of the finishing materials will have to be procured in the neighboring countries, while all of the mechanical and electrical installations will have to be procured either in the neighboring countries or in Japan. The Contractor will, therefore, have to ensure that the construction schedule is not adversely affected by delays in their procurement by collecting in advance the requisite information concerning such matters as the importation procedures and transportation time. Bearing in mind the fact that there was a time when the exportation of certain construction materials was prohibited in Thailand for reasons arising out of the domestic situation, there will be a need also to conduct a thorough study in advance on the situations in the countries from which the materials are to be imported. While most of the construction machinery required can be procured within Cambodia, care will also be required here as the increased demand for construction is expected to result in a shortage of construction machinery at the implementation stage of the project.

There is no established system of laws and regulations concerning building design and permission for building construction in Cambodia. According to the information provided by the municipal authorities in Phnom Penh at the stage of the Basic Design Study for the project, a City Planning Law is in the process of being drafted, but it will be some time before this law comes into force. The facilities should therefore be designed and their construction method determined in accordance with standards which are recognized in Japan and internationally. There will be a need, however, to check whether there has been any movement concerning the City Planning Law and other relevant laws and regulations at the stage of the Detailed Design.

### 3-1-3 Scope of Works

#### (1) Work to be Conducted by the Japanese Side

The funding provided by the Government of Japan is to be utilized for the construction/installation of the targeted facilities and exchange buildings including the supply of equipment and materials for completion of the Project.

Main facilities to be conducted using the fund are as follows:

- 1) Construction of the three telephone office buildings (Central, West and Airport telephone offices)
- 2) Removal of the existing fencing around the site of the Central Telephone Office
- 3) Site leveling and exterior work, including construction of new fencing and gates, at all three sites
- 4) Connection of the building drainage equipment to the nearest off-site drainage system
- 5) Installation of switching equipment in the 3 telephone offices
- 6) Installation of transmission equipment for junction network
- 7) Installation of radio subscriber system (digital MAS)
- 8) Construction of antenna tower and poles including foundation
- 9) Installation of power supply system for telephone offices and radio subscriber stations
- 10) Installation of metallic cables for local cable network and optical fiber cables for junction cable network
- 11) Construction of manholes and ducts
- 12) Provision of necessary equipment/materials and accessories for the above

- 13) Installation of commercial power supply for the West and the Airport telephone offices
  - 14) Transportation with necessary costs for all equipment and materials to be procured in foreign countries
  - 15) Designing/Plan of facilities for installation and construction, and also testing and commissioning of the network as a system
  - 16) Provision of special tools, spare parts, test equipment/materials and vehicles to be required for maintenance of the network established by the Project
  - 17) To conduct temporary re-pavement of roads so that gravel cannot be scattered by cars
- (2) Work to be Conducted by the Cambodian Side
- 1) Procurement of building sites
  - 2) Acquisition of all legal permits required for the construction work
  - 3) Provision of explanation concerning the construction work to residents of areas around the construction sites and guarantee of adequate understanding on the part of the residents concerning the construction work
  - 4) Preparation of sites for commencement of construction work at all three sites, including the removal of the existing building on the site for the Central Telephone Office
  - 5) Extension of water supply systems to the construction sites, or regular supply of water by means of tank lorries
  - 6) Acquisition of all permits required for connection to off-site drainage facilities
  - 7) Provision of miscellaneous items required at the telephone office sites (telephones, vegetation, furniture, utensils etc.)
  - 8) Final re-pavement of roads after completion of cable installation works and temporary restoration done by the Contractor
  - 9) Removal of existing cables, poles and any other disused facilities
  - 10) Installation and removal of dropwires and apparatus in subscribers' premises
  - 11) Installation of jumper wires at MDF in new exchanges and at terminal block in cabinets for subscriber connection

- 12) Commercial power supply and its receiving panel, so called Main Distribution Panel (MDP) at the Central telephone offices
- 13) Taking necessary procedure of application for approval to the authorities concerned on electric power connection to the West and the Airport telephone offices
- 14) Commercial power supply for six (6) subscriber stations of the digital MAS
- 15) Provision of warehouses for keeping the equipment and materials to be used for the Project
- 16) Connection work required for the necessary number of circuits for Junction cable network, between DDF and International switching equipment in the ITC and E10B switching equipment in the training center, together with necessary materials such as terminal blocks for DDF are provided by the MPTC

The general items mentioned below are to be executed by the Government of Cambodia.

- All items to be executed by the recipient country are to be stated in the Exchange of Notes
  - Taking necessary procedure of exemption from taxation for all equipment and materials to be imported by the Project
  - The following commissions to the Japanese foreign exchange bank for the banking services based upon the Bank Arrangement
    - Advising commission of Authorization to pay
    - Payment commission
- (3) Points of Note concerning the Responsibilities of the Government of Cambodia

The construction of the Central Telephone Office building and the installation of equipment in this building under Phase I of the project will be implemented under an extremely tight schedule. If the removal of the existing building on the Central Telephone Office site cannot be completed by the beginning of the construction work, it will be more or less impossible to complete this phase of the project within the contract period for the provision of assistance from the Government of Japan, and the assistance plan as a whole will be put in jeopardy. So as to prevent such a serious situation arising, the Government of



Cambodia should start considering the means of securing the funds required for the removal of the building before the Exchange of Notes (E/N), and should commence the removal work as soon as the Notes are exchanged.

### 3-1-4 Implementation Supervision Plan

#### (1) Details of Supervision Work

Supervision of the Project will be carried out by a Task Force Team consisting of the MPTC staff and consultant of which organization of project implementation is shown in Figure 3.1, as follows:

##### 1) Work Related to Contracts

The consultant will carry out following works:

Preparation of design drawings and tender documents, preliminary investigation of qualifications of tenderers, acceptance of bids, evaluation of bids and selection of contractors, preparation of contracts, witness at signing of contracts etc.

##### 2) Examination of Submissions from Contractors

The Task Force Team will examine and approve the materials submitted by the construction contractors and equipment manufacturers (working drawings and product samples)

##### 3) Witness to factory inspection

The Task Force Team will witness factory inspection in manufacturers' factories prior to the shipment of equipment and materials by the contractor to verify that the shipping equipment and materials conform to the contract specifications. The contractor will ship the equipment and materials after obtaining the Task Force Team's approval.

##### 4) Installation supervision

The installation methods and bill of quantities submitted by the contractor will be studied by the Task Force Team, who will then issue any necessary instructions. While the installation work is in progress, the Task Force Team will dispatch supervisors to the work sites to conduct

inspections for the purpose both of ascertaining whether or not the installation work done conforms to the contract specifications and of monitoring the progress of the installation work. The Task Force Team will make appropriate guidance for implementing the subscriber connection works to be carried out by the MPTC and also operation and maintenance of the vehicles to be required for the subscriber connection.

5) Cooperation concerning Payment Procedures

The Task Force Team will examine the invoices etc. from the contractors for contracted fees to be paid during and after the construction work, and the actual procedure for payment

6) Handing-over of system

The Task Force Team will witness the acceptance test at the completion of the contractor's works, and examine the drawings of the completed facilities. When the acceptance test results prove that the completed works conform to the contract specifications, the Task Force Team will report to MPTC to accept the system.

(2) Supervision Personnel Plan

High level construction supervision is required in this project, which is to be implemented under the tight, overlapping schedule discussed above. In construction supervision by the consultant, the emphasis will be on the constant monitoring of the overall progress of work, and on the sustained provision of guidance and advice to the contractors and to those responsible in the Government of Cambodia, so as to ensure the quality required of the buildings as well as respective system and adherence to the construction schedule. The dispatch of a permanently stationed supervisor will therefore be indispensable, and this will have to be complemented by the temporary dispatch of an additional supervisor to deal with the tight schedule. There will be 6 supervisors, consisted a team leader for the Project and 3 supervisors for outside plant, Switching/transmission equipment and building construction work, and also 2 supervisors who will be dispatched in the short term when required for building equipment work and for inspection and approval of equipment and materials to be imported at the manufacturer's factory(ies).

A prerequisite condition in the selection of the supervisors will be that the candidate chosen must have a wide field of vision and a capacity for coordination work, in addition to having ample experience and ability to make appropriate judgments on technical matters.

### 3-1-5 Procurement Plan

#### (1) Material Procurement Plan

##### 1) Material Procurement Plan for Telecommunications

According to the field work findings made by the Study Team, materials obtainable in Cambodia, among those necessary for implementation of the Project, are cement, sand, gravel, crushed rock, brick, lumber, concrete plate and asphalt necessary for temporary recovery of pavement and concrete poles for DP and subscriber connections. The PVC pipe used for ducts of telecommunication civil facilities will be supplied from Thailand because its quality and cost are acceptable for this project.

The cost comparison on metallic cable was made between cables provided from Japan and that from third countries. While the cost for only the cable itself to be procured from Japan will be slightly cheaper than that from third countries and consideration of the competitive bidding of the Project, the total cost of procurement including the cost for transportation and other necessary materials for installation of cables will be reduced more than that from third countries. Therefore, metallic cable are considered to be procured from Japan.

The other equipment and materials will be procured in Japan, in consideration of the technical high reliability and ensuring the procurement of materials to be utilized effectively for operation and maintenance of facilities. However, the possibility of the procurement of equipment and materials for the Project will be reconsidered in the stage of detailed design to be carried out in succession of the study.

##### 2) Material Procurement Plan for Building Construction

The construction materials produced in Cambodia are limited to basic products, such as concrete aggregate, concrete forms and bricks, and such

materials as structural steel frames and various types of interior finish materials, are mostly imported from abroad. Of the mechanical and electrical equipment, more sophisticated items, such as air-conditioning and ventilation equipment and fire alarms, are unavailable on the domestic market. Simpler items, such as electric wires and cables, conduit pipes, socket outlets, piping materials and sanitary ware, are imported from neighboring countries and are available, but these are unstable and unreliable in terms of their quality, specifications and supply. While the basic rule under the present project will be to procure the construction materials in the host country, materials that cannot be procured locally and materials of which the locally available equivalents are unreliable in terms of quality and supply, will be procured in Japan or in a third country. The principal construction materials are listed according to their procurement sites on the Table 3.1.

(2) Material Transportation Plan

The materials procured in Japan will be transported by sea to Sihanoukville in Cambodia and thence by land to the project sites in Phnom Penh. Since most of the materials procured in Japan are precision equipment, and because there are also problems of security during overland transportation, these will be transported in containers. A candidate for the "third country" for material procurement is Thailand. Because of the high risks along the overland transportation route from the northern borders of Cambodia, materials from Thailand, too, will be transported by sea and landed at Sihanoukville as in the case of materials procured in Japan. They too will be transported in containers, conventional vessels being used only for transportation of long materials (reinforcement steels etc.) which cannot be accommodated in containers. The time required for transportation from the bonded warehouses in the countries of origin to the project sites in Phnom Penh, including customs clearance at the port of discharge, will be approximately 30 days for transportation from Japan, and 20 days for transportation from Thailand.

The flow chart of transportation is shown in Figure 3.2.

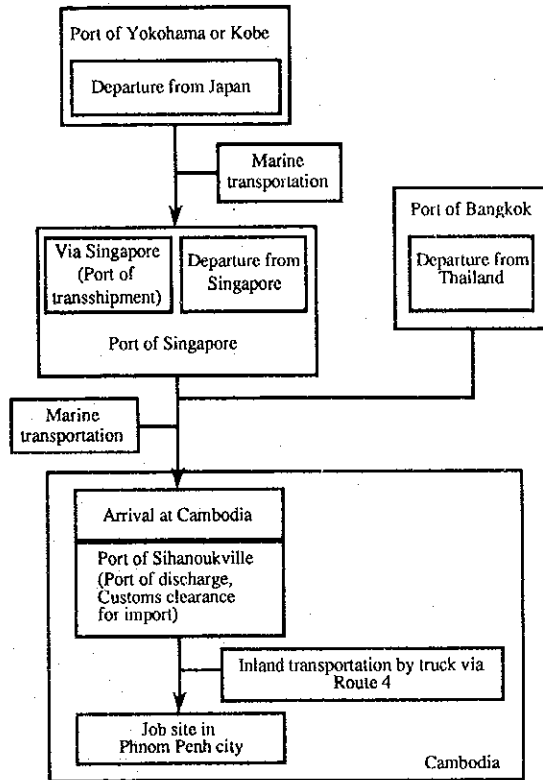


Figure 3.2 Transportation Route of Imported Equipment and Materials

Table 3.1 Procurement Plan for Principal Construction Materials

Item	Origin			Remarks
	Cambodia	Third Country	Japan	
(Building Work)				
• Aggregate	o			• No problems in terms of hardness, grain size and supply
• Cement	o			• High quality imports from Thailand available locally
• Reinforcement bars		o		• No local products
• Bricks	o			
• Waterproofing materials		o		• No local products
• Aluminum fixtures		o		• No local products
• Steel fixtures		o		• No local products
• Wooden fixtures		o		• Local products available but of low quality
• Terrazzo	o			
• Plastering materials	o			
• Porcelain tiles		o		• No local products
• Terrazzo tiles		o		• Local products available but of low quality
• Paint		o		• No local products
• Metallic ceiling base		o		• No local products
• Vinyl tiles		o		• No local products
• Ceiling boards		o		• No local products
(Equipment Work)				
• Distribution panels		o		• No local products
• Electric wires/cables		o		• No local products
• Lighting equipment		o		• No local products
• Switches		o		• No local products
• Socket outlets		o		• No local products
• Ceiling fans		o		• No local products
• Air conditioners		o	o	• To ensure high quality and performance; origin determined according to specifications
• Ventilation fans			o	• To ensure high quality and performance
• Air supply & exhaust ports			o	• To ensure high quality and performance
• Duct materials		o		• No local products
• Piping (vinyl chloride)		o		• Local products available but of low quality and supply unstable
• Piping (steel)		o		• No local products
• Sanitary ware		o		• No local products
• FRP water tanks			o	• To ensure high quality and performance
• FRP water treatment tanks		o		• No local products
• Pumps			o	• To ensure high quality and performance

### 3-1-6 Project Implementation Schedule

The implementation schedule of the Project is as described below.

The time required for the completion of the Project including the contract signing is to be 31 months. The implementation time schedule is summarized in Table 3.1.

This Project is to be executed in two (2) phases:

#### Phase 1:

Rehabilitation of the public telecommunications network in the Central exchange area, construction of an exchange building, installation of outside plant, switching equipment and transmission facilities for junction network between Central Telephone Office and ITC, including necessary power supply equipment and associated works.

#### Phase 2:

Rehabilitation of the public telecommunications network in West and Air Port exchange areas, construction of exchange buildings, installation of outside plant, switching equipment and transmission facilities for the junction network between these exchanges and between West and Central Telephone Office, including necessary power supply equipment and associated works.

Provision of digital MAS network in the project area, construction of base station at the Central Telephone Office including antenna tower and subscriber stations with necessary power supply equipment and associated works.

Table 3.2 Implementation Schedule for the Project

Phase	Items	0	1	2	3	4	5	6	7	8	9	10	11	12
Phase I	Detailed Design Field Survey		_____											
	Preparation of Tender Document			_____										(Total 3.0 Months)
	Manufacturing				-----									
	Transportation									-----				
	Building Construction													-----
	Construction/ Installation													-----
	Testing													-----
														(Total 12.0 Months)
Phase II	Detailed Design Field Survey		_____											
	Preparation of Tender Document			_____										(Total 2.0 Months)
	Manufacturing				-----									
	Transportation									-----				
	Building Construction													-----
	Construction/ Installation													-----
	Testing													-----
														(Total 12.0 Months)



3-2 Project Cost to be borne by the Government of Cambodia

The Cost to be borne by the Government of Cambodia which amounts to two million three hundred ninety thousand US dollars is shown in the table below.

Project Cost to be borne by the Government of Cambodia

(unit: Thousand US dollar)

	Phase 1	Phase 2	Total
1) For Outside Plant			
a) Final re-pavement of roads	643.5	436.5	1,080.0
b) Removal of existing cables and poles	4.5	1.5	6.0
c) Subscriber connection (including apparatus)	565.3	354.7	920.0
Sub-total OSP	1,213.3	792.7	2,006.0
2) For building construction leveling, fencing and others	113.5	137.2	250.7
3) Transmission facilities	8.5	-	8.5
4) Radio Subscriber System			
a) Preparation of sub. station	-	52.0	52.0
b) Subscriber connection	-	29.8	29.8
c) Commercial power supply for sub. station	-	1.5	1.5
Sub-total of radio sub. system	-	83.3	83.3
Grand Total	1,335.3	1,013.2	2,348.5

3-3 Operation and Maintenance Plan

3-3-1 Operation and Maintenance Formation

Since the volume of facilities under the Project is comparatively larger than that of existing telecommunications facilities, it is necessary to establish such operation and maintenance formation as matches the coming telecommunications facilities' situation. The establishment of a telephone office will therefore be proposed.

(1) Telephone Office organization

Currently, there are no independent telephone office organizations in the MPTC. The maintenance and operations division of the MPTC is directly controlled by the Under Secretary of the State. The system is reasonable when the main facilities are installed in the same premises of the MPTC office and the number of subscribers are few. At the completion of the Project, three times as many

subscribers as the existent ones will be newly connected, therefore the introduction of the telephone office organization will be proposed.

The telephone office organization will be established under the chief of the telephone office who will be solely responsible for all the maintenance and operations under the management of MPTC headquarters. Figure 3.3 shows the proposed organization.

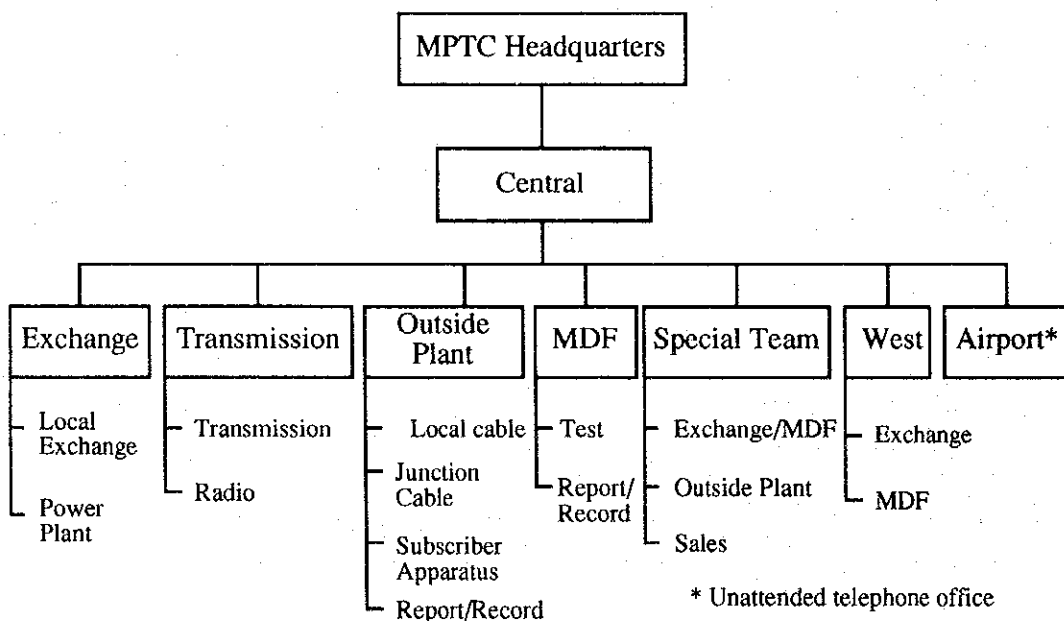


Figure 3.3 Proposed Telephone Office Organization

The Central Telephone Office will be the attendant office and the center of maintenance and operations in three new telephone offices. The operation and maintenance staff of the West Telephone Office will station the office only in the day time. The operation and maintenance in the day time is carried out by the staff stationed in the Central Telephone Office. At night, maintenance and operation staff will station the Central Telephone Office for watch duty. If equipment in the West and/or Airport Telephone Office breaks down during the night, the staff in the Central Telephone Office will go to make repairs. For this purpose, vehicles for the exchange section and for the transmission section are to be newly introduced.

(2) Special Team for new subscriber connections

The MPTC will have to make more than 4,000 new subscriber connections within a certain short term which is currently estimated as 3 years under the Project while it currently does work for 200 to 300 new subscriber connections per year. To meet this drastic change of work load, it will be proposed that the MPTC prepares a special team of the following staff for new subscriber connections. The manpower on the special team will gradually be transferred to that of maintenance and operations in proportion to the increase of work efficiency of individuals and will be completely transferred to that of maintenance and operations after completion of the mission.

- Exchange and MDF

Four staff who will carry out subscriber data input, MDF jumpering and testing of the overall performance of newly connected circuits.

- Outside plant

Thirty-one staff who will implement cabinet jumpering, dropwire installation, house wiring work and terminal installation.

- Sales and Account

Four staff who will be in charge of clerical work at the sales window, including reception of necessary money for new subscriber connections from applicants.

(3) Vehicle Dispositions

Necessary vehicle dispositions for new subscriber connection work and all maintenance works are shown below.

	<u>Necessary Vehicles</u>	<u>New</u>	<u>Existent</u>
- Junction circuits maintenance Number of personnel: 3 (1 team x 3)	1	1	-
- Subscriber lines maintenance Number of personnel: 18 (6 teams x 6)	6	3	3
- Subscriber connection Number of personnel: 21 (7 teams x 3)	7	4	3
- Exchange & transmission equipment maintenance Number of personnel: 6 (2 teams x 3)	2	2	-
- Radio subscriber equipment maintenance Number of personnel: 2 (1 team x 2)	1	1	-
- Manager Number of personnel: 1	1	-	1
Total number of personnel 51 persons	18	11	7

Total number of necessary vehicles for the Central telephone office is 18. At present MPTC has 7 vehicles for domestic telecommunication department and it expects to get more 11 vehicles by this project. Eight vehicles out of eleven have arrangement shelves for construction materials of outside plant. The other three vehicles are used for exchange, transmission and radio equipment maintenance. The three vehicles for maintenance of OSP and radio subscriber system and for new subscriber connection work among the 11 vehicles stated above are provided with the function of 4 wheel driven, due consideration of the difficult working conditions such as, the operation of vehicles on the unpaved road outside the city center and the road covered by the water in the rainy season.

Following principle is applied to determine the number of staff in a working group.

1) Number of group for the repairing work

After the completion of the Project, 15,500 subscribers are to be accommodated. Suppose that the fault rate is worldly accepted average

level, namely, less than one fault per 100 subscribers per month which is the of telecommunications facility operation, the number of fault occur on the telephone network in the objective area will be 1,860 fault per annum.

Adding to the above, given that the existing subscribers accommodated by both Takhmau and North telephone offices are around 2,000 who are patient of the fault rate of 13 faults per 100 subscribers per month, the number of fault of the areas will be 3,100 fault per annum then there will be in total 4,960 faults per annum in Phnom Penh city and its surrounding areas.

On condition that the efficiency of field work staff of the MPTC in fault repair activities are to be to repair three faults per day per group consisting of three working staff and their working day per annum will be 280 days, six field work groups are necessary following calculation.

$$\frac{4,960 \text{ (faults)}}{280 \text{ (days)} \times 3 \text{ (staff)}} = 5.9 \text{ groups}$$

2) Number of group for the new subscriber installation work

Provided that two year duration will be allowed for the 15,500 new subscriber installation work while maximum four installation works will be carried out per day per group consisting of three working staff and their annual working days are to be 280 days, seven field work group are to be necessary.

3) Improvement of management for vehicle

While mobilization of MPTC staff is indispensable for the new subscriber connection work promptly and as scheduled as well as for operation and maintenance for the facilities to be constructed by the Project, it is also indispensable to utilize vehicles for these works.

The operation of these vehicles more effectively than present, current management of vehicles will be improved and the following are the main items of the management to be pointed out:

- To appoint person in charge of vehicle operation  
To appoint person in charge of whole vehicle operation and to appoint person in charge of each vehicle individually who are to manage daily the vehicles including the destination of the trip in each time;
- To prepare and keep the vehicle operation record  
To record the day/date of operation, running distance, fuel and oil consumption, name of driver, day of regular inspection and so on;
- To inspect and maintain the vehicle regularly  
To inspect and maintain regularly in order not to be out of order during working time; and
- To specify the parking lot for each vehicle  
To specify the parking lot and to prepare preventive actions against robbery such as locked gate and security guard at the same time it is necessary to set up emergency countermeasure system against the case of robbery.

3-3-2 Spare Parts and Manpower

(1) Spare parts

Spare parts for operating and maintaining the facilities constructed under the Project will be proposed by the contractor in the implementation stage. Even the kind and quantities will be proposed by the contractor. The following table shows the list of spare parts which are the minimum needed for maintenance and operation. Details are stated in the Chapter 2-3-2, (6) "List of Spare Parts".

(2) Manpower requisition

The number of the MPTC staff to be increased after completion of the Project is, following the examination above, 18 persons. Most of this telephone office staff can be transferred from the MPTC's present domestic telecommunications operation staff, however, the skill to operate the facilities of newly introduced technology demands further promotion of their technical skills. The contractor will carry out training for MPTC staff to enable them to adjust to operation of the newly introduced equipment. In addition, the promotion of these skills requires MPTC's management, including staff, to prepare a marginal manning allocation for a continuous training program afterwards.

3-3-3 Budget for Operation and Maintenance

The following table shows the main items of expense assumed per annum caused after the completion of the Project.

Expense Assumption (P.A.) (US\$, thousand)

Item	Assumption
Manning Cost	72
Utility	290
Vehicle Operation	10
Petroleum for Engine Generator	356
Spareparts and miscellaneous	213
Payment to OTCI	9,249
Total	10,190





## **CHAPTER 4**

### **Project Evaluation and Recommendation**



CHAPTER 4. PROJECT EVALUATION AND RECOMMENDATION

4-1 Project Effect

Telecommunications equipment and the facilities to be introduced by the Project are superior in terms of expandability. Therefore, the MPTC can implement the expansion of the network and the formulation of the nationwide network in the future by applying the revenue accrued from their own network. Thus, the implementation of this Project contributes to socio-economic improvements not only in the capital city of Phnom Penh but also throughout the whole country, through the establishment of telecommunications network nuclei toward the formation of a total network in Cambodia in the future. Furthermore, it is judged to be appropriate that the Government of Japan provides the grant aid for the implementation of the Project, because the Project will bring widespread benefits to the public and there is no uncertainty regarding operation and maintenance of the facilities after completion of the Project.

The following benefits can be expected from the implementation of the Project for rehabilitation and expansion of the telecommunication network in the capital city of Phnom Penh.

- 1) The public telecommunication network to be constructed by the Project (hereinafter referred to as the Network) can provide high quality telephone services to 15,500 subscribers at the initial stage in Phnom Penh city and surrounding areas. Therefore, the population of 120,000 people in the objective area can benefit from this service.
- 2) The Network can make a great contribution to promoting the Socio-Economic Rehabilitation Plan 1994-1995 which is being implemented by the Government of Cambodia, and to obtaining assistance more effectively from foreign countries and/or international organizations, through the improvement of communication between ministries and relevant administrative offices.
- 3) There are 10 large-scale hospitals in Phnom Penh city, with 2 telephone lines connected to each of 8 hospitals, one hospital with only 1 line, and the remaining hospital with no telephone line at all. Even these telephone lines are frequently out of order, especially in the rainy season. No proper means of

communication is available to patients and hospitals for emergency cases at present. However, the Network will allow patients to utilize the hospitals more effectively in emergency cases, as well as improving operations of hospitals, through the provision of proper means of communication with the public.

- 4) Most fire stations, police stations and schools in the city are not currently provided with public telephone services. Moreover, areas outside the city of Phnom Penh are not provided with any services at all. There is no choice for the public but to communicate face-to-face, walking or traveling by motorcycle as necessary, even in emergencies. However, the Network can provide proper means of communication to the public.
- 5) The Network contributes greatly not only to the improvement of the telecommunications network in Phnom Penh city but also to the foundation of a nationwide telecommunications network to be formulated in the future. The quality of the network and the quantity of facilities will be remarkably improved by the Network, and the benefits of Ministry of Posts and Telecommunications Cambodia (hereinafter referred to as "the MPTC") will be expected to increase in accordance with the number of new subscribers. Therefore, the MPTC can apply the cross subsidy mechanism in which the revenue accrued from profitable areas should be invested for the development and/or improvement of the network of unprofitable areas.
- 6) The network's total fault rate in the present system is 13.0 per 100 subscribers, due to obsolete facilities in the present network and insufficient spare materials for maintenance. Since 90 % of 4,800 present subscribers should be transferred to the new network, the fault rate can be remarkably reduced to less than 1.0 per 100 subscribers by the Network

4-2 Recommendation

For the purposes of smooth and effective implementation of the Project, the following recommendations are made to the MPTC:

- 1) It is expected that the MPTC should positively apply the revenue from the network constructed by the Project to the rehabilitation and expansion of the rural telecommunications network.
- 2) The MPTC adopts the flat rate system as the tariff system for the present, and it is expected that the MPTC will change from the flat rate system to the meter pulse system, so that the monthly fee can be reduced and the number of subscribers increased. Following this, the MPTC should increase its own budget to construct the nationwide network in the future.
- 3) In general, the quality of the materials and installation work for the subscriber connection may severely effect the total network and poor quality may cause increments in total failure rate of systems in developing countries. In order to avoid such failure, the MPTC should take the following actions:
  - To prepare appropriate specifications of equipment and materials to be applied for subscriber connections,
  - To prepare appropriate manuals for installation work,
  - To establish the inspection procedure system for subscriber connections to check whether the work is completed according to installation manuals and materials as instructed in the specifications.
- 4) The digital MAS installed by the Plan, could be reused by being moved to another location. So, it is expected that new telephone offices will be open in accordance with the development plan of the Feasibility Study in the future, then the subscribers who are supplied with communication services by the existing subscriber radio system, will be transferred into the new telephone offices, and after that, the MPTC will efficiently use them by moving the unneeded subscriber offices to some area where the service has not yet been provided one at a time.
- 5) Up to the present, the MPTC has 2 year and 3 year training courses in the telecommunications department. It is desirable that the MPTC will develop the

existing training courses further and set up the leader's training course to cope with the new telecommunications facilities introduced by the Project. In order to effectively operate and maintain the facilities established by the Project, it is desirable for the MPTC to train many employees through on-the-job training in order to obtain a large number of qualified people.

- 6) The MPTC should realize the computerization of the management system for recording the equipment and facilities after completion of the Project. The system can be utilized for maintenance and renewal the facilities record and drawings. Also it is expected that the system contributes to the smooth implementation of the subscriber connection works.

## **Appendices**





**Appendix 1. Member List of the Survey Team**

(1) Basic Design Study

Name	Duty	Affiliated to
Tomio TAKAHASHI	Team Leader / Telecommunications Planner	Special Advisor, International Cooperation Div., International Affairs Dep., Ministry of Posts and Telecommunications
Kenji MAEKAWA	Project Coordinator	First Project Management Div., Grant Aid Project Management Dep., JICA
Shizuhiro UMEMURA	Chief Consultant	NTT International Corporation
Akira SHIRAI	Architecture Planner	Nissoken
Masayuki OIKAWA	Cost Estimation	Nippon Telecommunications Consulting Co., Ltd.
Sumio MORITA	Facility Planner	Nissoken

(2) Explanation for the Draft Basic Design Report

Name	Duty	Affiliated to
Toshinobu KATO	Leader / Project Coordinator	Second Basic Design Study Div., Grant Aid Study Design Dep., JICA
Masato YOSHIDA	Telecommunications Planner	Section Chief, Land Mobile Communications Div., Radio Dep., Ministry of Posts and Telecommunications
Shizuhiro UMEMURA	Chief Consultant	NTT International Corporation
Akira SHIRAI	Architecture Planner	Nissoken
Masayuki OIKAWA	Cost Estimation	Nippon Telecommunications Consulting Co., Ltd.

**Appendix 2. Survey Schedule**

(1) Basic Design Study

Date	Contents of Activity
20 Apr. (Thu.)	Departure from Tokyo and arrival in Bangkok
21 Apr. (Fri.)	Arrival in Phnom Penh Meeting with JICA Meeting with MPTC
22 Apr. (Sat.)	Site survey
23 Apr. (Sun.)	Site survey
24 Apr. (Mon.)	Site survey
25 Apr. (Tue.)	Site survey Meeting with JICA Courtesy call to Japanese Embassy Courtesy call to MOFA and MPTC
26 Apr. (Wed.)	Discussion on Inception Report with MPTC and Authorities concerned Site Survey
27 Apr. (Thu.)	Signing of Minutes of Discussion Site survey
28 Apr. (Fri.)	Report to JICA and Japanese Embassy Departure from Phnom Penh
29 Apr. (Sat.)	Departure from Bangkok and arrival in Tokyo

(2) Explanation for the Draft Basic Design Report

Date		Contents of Activity
5 June	(Mon.)	Departure from Tokyo and arrival in Hong Kong
6 June	(Tue.)	Arrival in Phnom Penh Meeting with JICA Courtesy call to Japanese Embassy and MOFA
7 June	(Wed.)	Discussion on the draft basic design report with MPTC and authorities concerned
8 June	(Thu.)	Discussion on the draft of Minutes of Discussion with MPTC
9 June	(Fri.)	Signing of Minutes of Discussion Report to JICA and Japanese Embassy
10 June	(Sat.)	Site survey Collection of cost estimation data
11 June	(Sun.)	Site survey Collection of cost estimation data
12 June	(Mon.)	Departure from Phnom Penh
13 June	(Tue.)	Departure from Bangkok and arrival in Tokyo

**Appendix 3. List of Party Concerned in the Receipt Country**

**Ministry of Posts and Telecommunications**

Mr. So Khun	Secretary of State
Mr. Lamphu An	Under Secretary of State
Mr. Koy Kim Sea	Under Secretary of State
Mr. Phan Phin	Under Secretary of State
Mr. Long Vanhan	Director National Telecom Dept.
Mr. Lar Narath	Director International Telecom Dept.
Mr. Sam Serey	Deputy Director National Telecom Dept.
Mr. Pot Sreang	Deputy Director National Telecom Dept.

**Ministry of Economics and Finance**

Mr. Chea Peng Chheang	Under Secretary of State
Mr. Chan Thy	Secretariat Section
Mr. Ckheang Vibol	Assistant to General Director
Mr. San Norin	Chief Office of Plan
Mr. Sun Kim Srun	Deputy Director Investment

**Ministry of Foreign Affairs and International Cooperation**

Ms. You Ay	Director International Cooperation Dept.
Mr. Hem Heng	Deputy Director International Cooperation Dept.

**Council for Development of Cambodia**

Ms. Heng Sokun	Official
----------------	----------

Ministry of Planning

Mr. Hing Chanmontha

Deputy Director of Economic Cooperation

Mr. Po Mao

Official

Phnom Penh Municipality

Mr. Ean Narin

Deputy Director of Public Work Dept.

**Appendix 4. Minutes of Discussions**

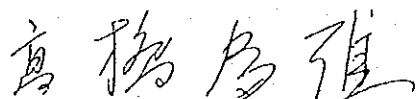
MINUTES OF DISCUSSIONS  
BASIC DESIGN STUDY  
ON  
THE PROJECT FOR THE DEVELOPMENT  
OF  
THE TELECOMMUNICATIONS NETWORK  
IN  
PHNOM PENH CITY, THE KINGDOM OF CAMBODIA

In response to a request from the Royal Government of Cambodia, the Government of Japan decided to conduct a Basic Design Study on the Project for the Development of the Telecommunications Network in Phnom Penh City (hereinafter referred to as "the Project") and entrusted the study to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA dispatched to Cambodia a study team, which is headed by Mr. Tomio TAKAHASHI, Special Advisor, International Cooperation Division, International Affairs Department, Ministry of Posts and Telecommunications and is scheduled to stay in the country from April 21 to April 28, 1995.

The study team held discussions with the officials concerned of the Royal Government of Cambodia and conducted a field survey in the study area.

In the course of the discussions and the field survey, both parties confirmed the main items described on the attached sheets. The study team will proceed to further work and prepare the Basic Design Study report.



---

Mr. Tomio TAKAHASHI  
Leader  
Basic Design Study Team  
JICA



Phnom Penh, April 27, 1995

---

Mr. Lamphu AN  
Under Secretary of State  
Ministry of Posts & Telecommunications  
Cambodia

## Attachment

### 1. Objectives

The objectives of the Project are to improve the telecommunications service in Phnom Penh city by constructing three (3) telephone offices and installing basic telecommunications facilities.

### 2. Project Sites

The Project sites are to be the whole area of Phnom Penh city and its surrounding areas including four (4) districts, i.e., Dangkor, Rossey Keo, Meanchey and Por Nhea Loeu Districts.

The following maps are attached in Annex I of this Attachment:

- Key map for Central, West and Airport telephone office areas      Annex I-1
- Location map for telephone buildings      Annex I-2
- Location map for Subscriber Stations of Digital MAS system      Annex I-3

### 3. Executing Agency

Ministry of Posts and Telecommunications is the executing agency to be responsible for the administration and execution of the Project.

### 4. Items requested by the Royal Government of Cambodia

After discussion between the Cambodian side and the Study Team, the following items were finally requested by the Cambodian side.

(1/2)

(1) Equipment

	Central Exchange CNT	West Ex. WST	Airport Ex. APT
1) Switching Equipment			
a) Type	LS	LS	RSU
b) Capacity	10,000 lu.	6,000 lu.	800 lu.
2) Transmission Equipment	Optical Fiber Cable 6 Core  SDH System CNT - WST      155 Mb/s (1 + 1) WST - APT      155 Mb/s (1 + 1) CNT - ITC      155 Mb/s (1 + 1) CNT - E10B      2 Mb/s (Tie Cable)		
a) Medium			
b) System			
c) Capacity			
3) Outside Plant			
a) Cable termination	2400 P x 5 cables	2400 P x 2 cables 1600 P x 1 cable 400 P x 1 cable	800 P x 1 cable
4) Power Supply	Engine generators for Back up  Rectifiers and Batteries		
a) AC Power			
b) DC Power			
5) Digital MAS	1.5 GHz band  TDMA / TDM  117 subscriber lines  5 lines/station  52 stations		
a) Radio Frequency			
b) Access Method			
c) Capacity			
d) Capacity per Subscriber stations			
e) Number of Subscriber stations			
6) Others	Materials and equipment for operation and maintenance including vehicles		

(2) Buildings

1) Central telephone office

- a) Telecommunications equipment rooms
- b) Power supply equipment room
- c) Staff rooms
- d) Classrooms for training
- e) Customer service, billing and collecting offices
- f) Maintenance rooms



- g) Building equipment rooms
- h) Other ancillary rooms (toilet, staircase etc.)

2) West and Airport telephone offices

- a) Switching and transmission rooms
- b) Battery and rectifier room
- c) Engine room
- d) Staff room

At the same time, the Cambodian side requested to make a flexible coordination with other projects realized by other donors in designing the facilities of the Basic Design Study as well. However, the final components of the Project will be decided after further studies.

5. Land Acquisition

The Cambodian side will issue a land acquisition certificate for the Project described in Annex I-2 to JICA Cambodia office by the end of May 1995.

6. Japan's Grant Aid System

- (1) The Royal Government of Cambodia has understood the system of Japanese Grant Aid explained by the Study Team using the materials attached in Annex II.
- (2) The Royal Government of Cambodia will take the necessary measures described in Annex-III for smooth implementation of the Project on the condition that Grant Aid assistance by the Government of Japan is extended to the Project.

7. Demarcation of Work

Principle of the job demarcation for installing the telecommunications facilities of the Project is described in Annex IV, in case Japan's Grant Aid is executed to the Project. However, the final demarcation will be decided after further studies.

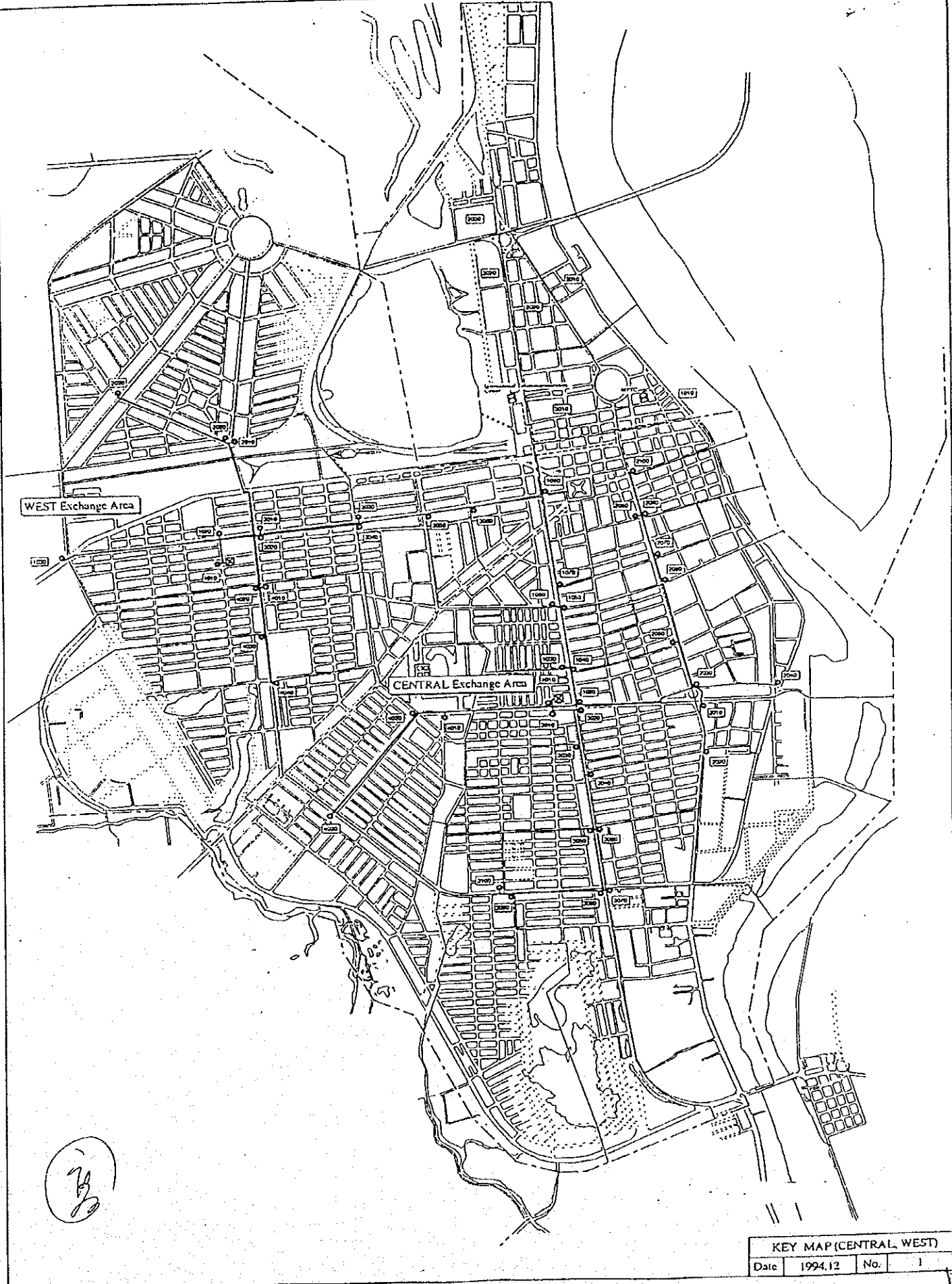
8. Schedule of the Study

- (1) JICA will prepare the draft Basic Design Report in English and dispatch a mission in order to explain its contents around June, 1995.

(11)

- (2) In the case that the contents of the report is accepted in principle by the Cambodian side, JICA will complete the final report and send it to the Royal Government of Cambodia by the end of July, 1995.

18

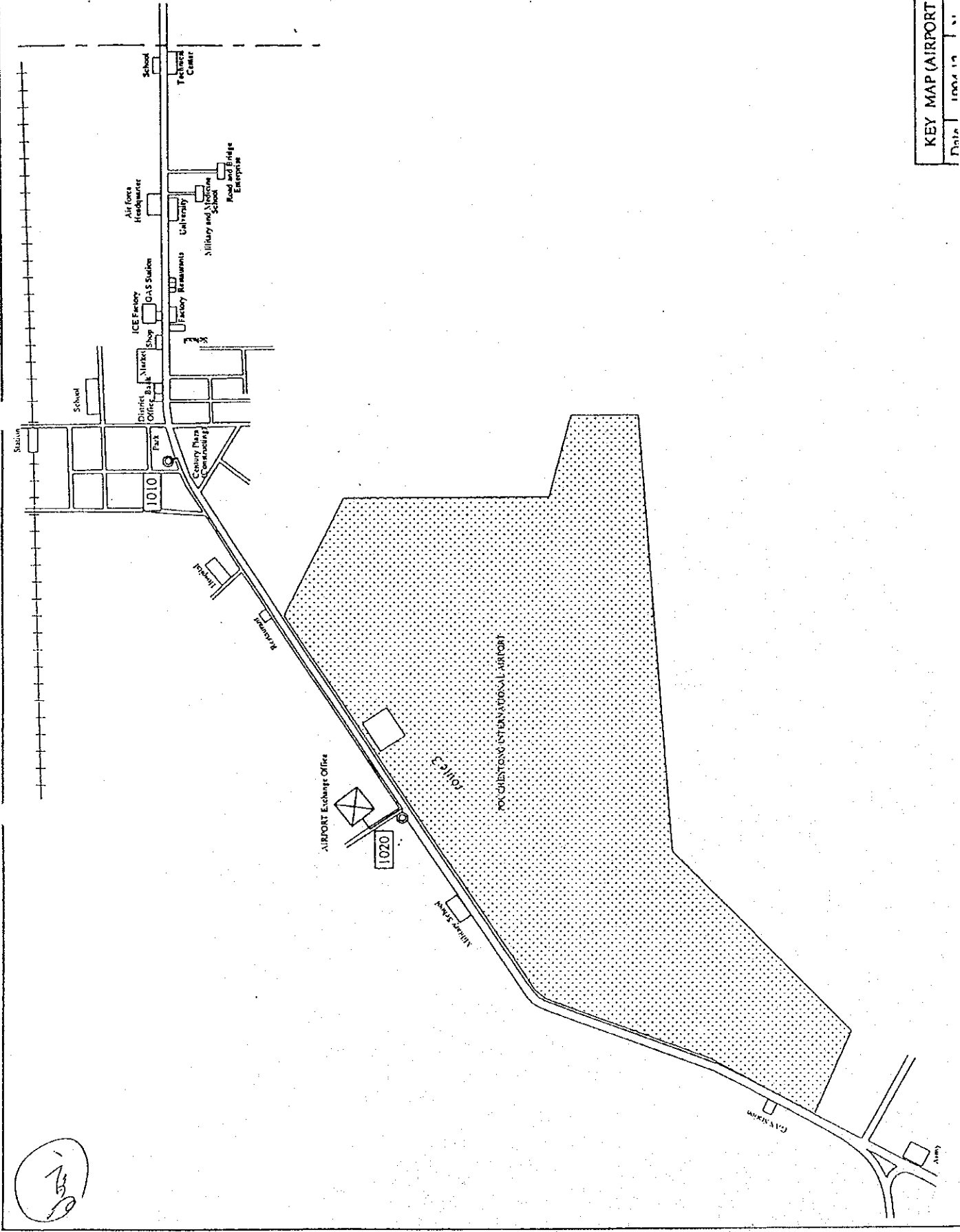


30

KEY MAP (CENTRAL WEST)			
Date	1994.12	No.	1

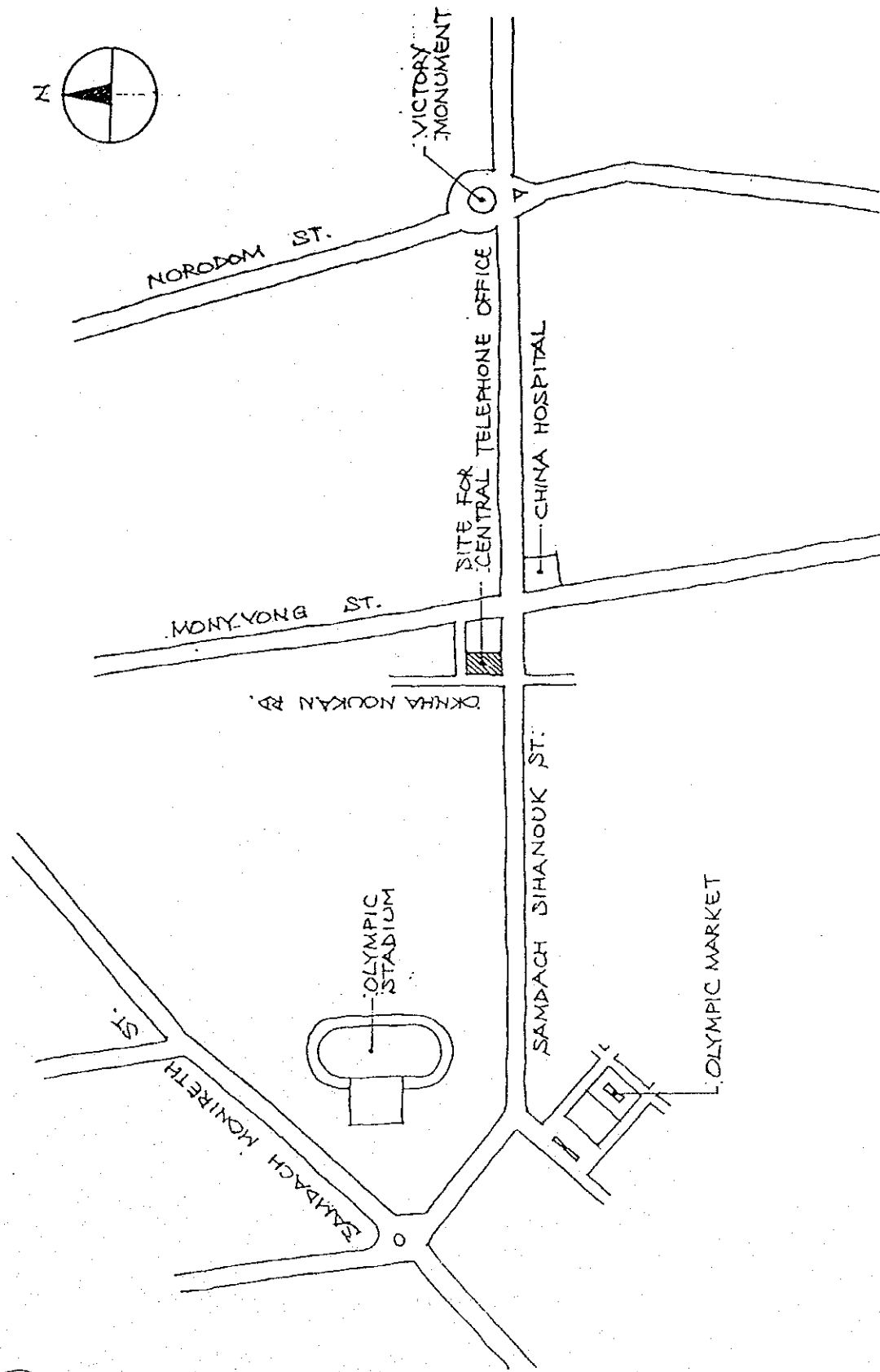
Annex I-1

KEY MAP (AIRPORT Exchange)  
Date: 1004.19



1010

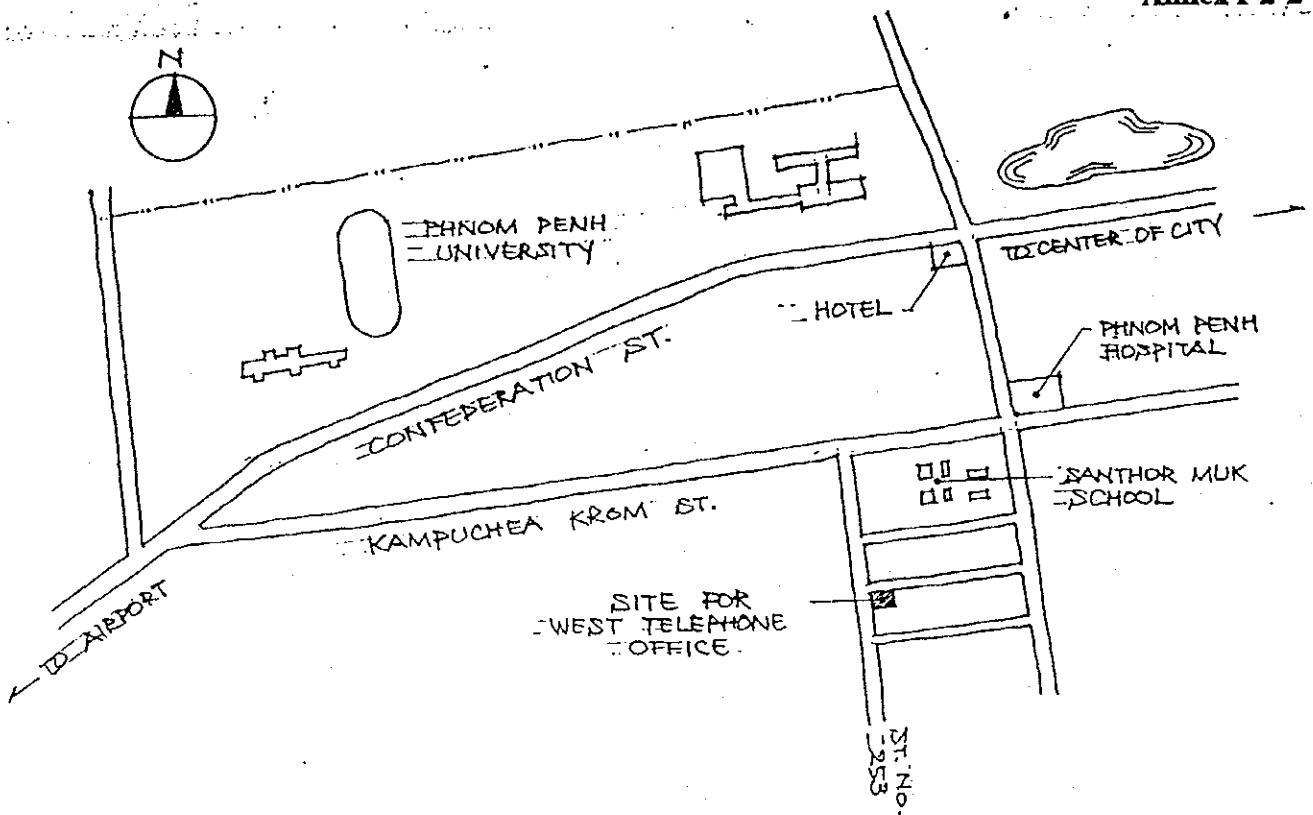
10



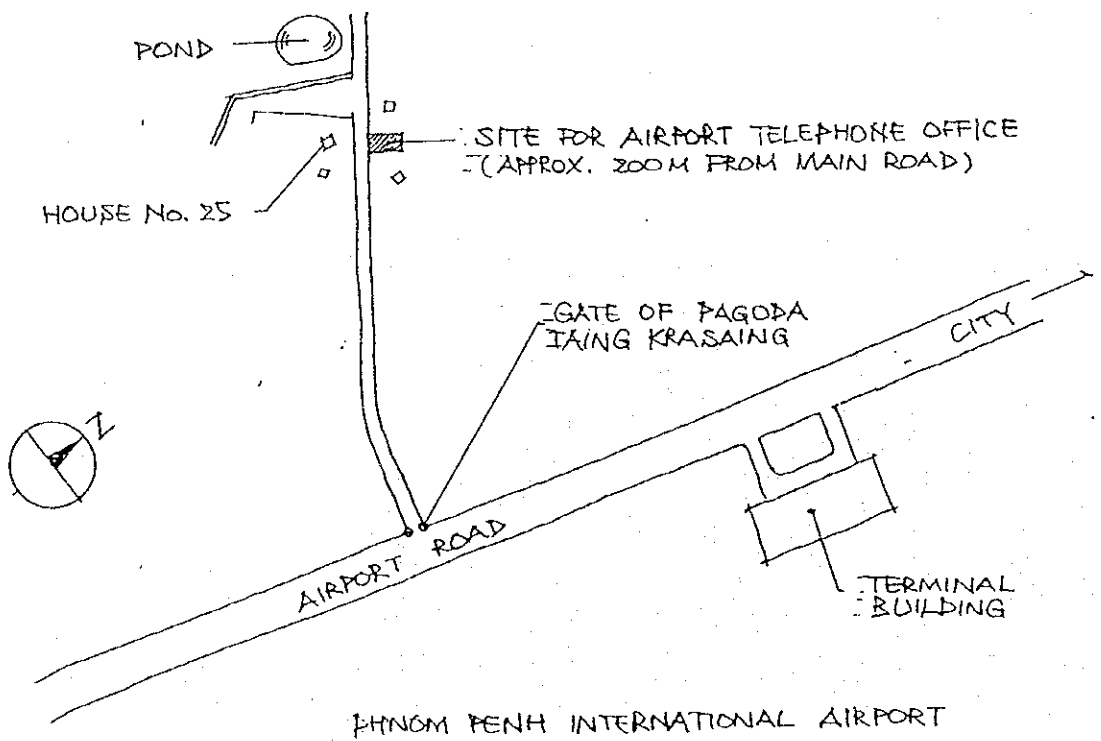
Location Map for Central Telephone Office

79

AP

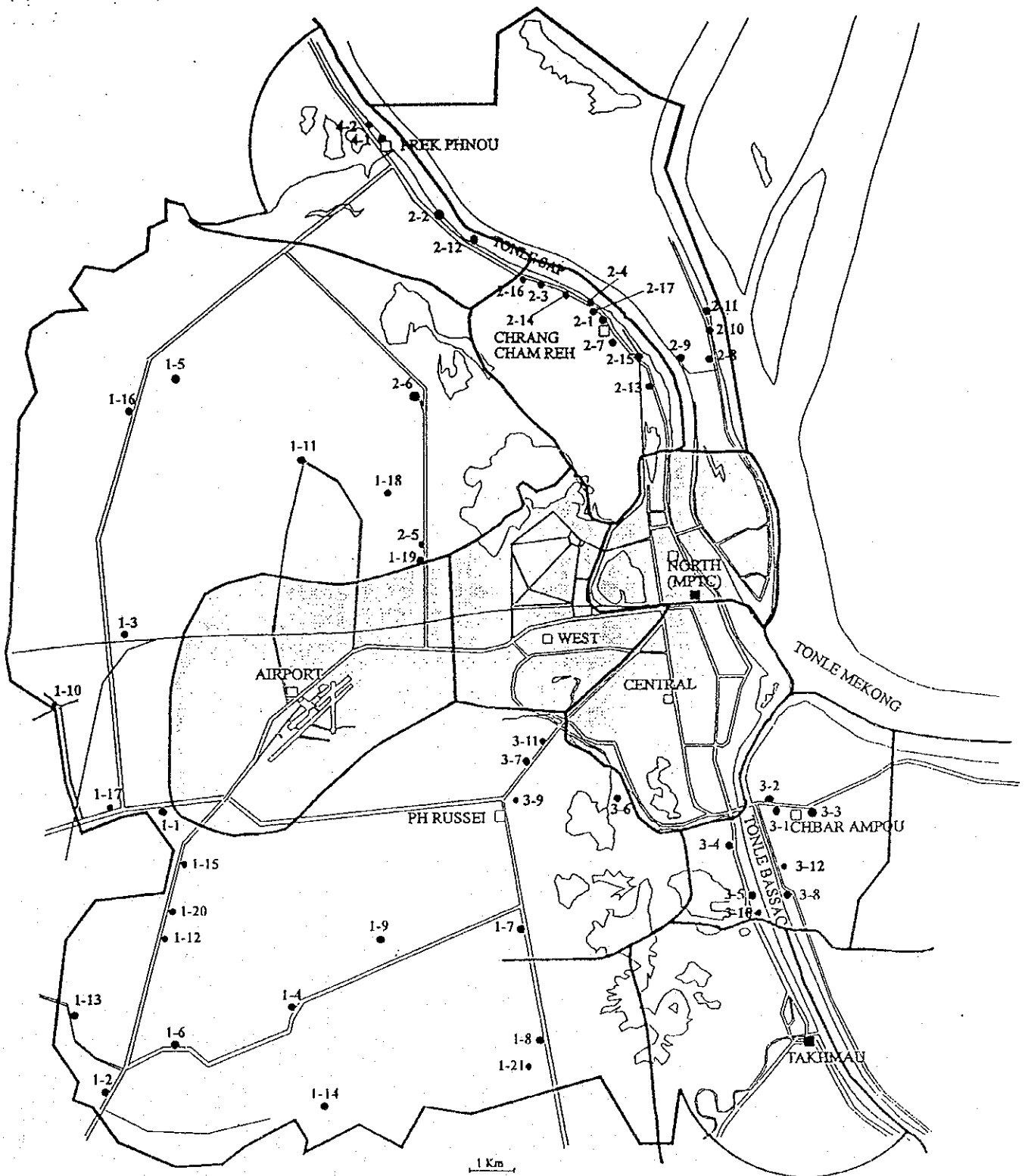


Location Map for West Telephone Office



Location Map for Airport Telephone Office





- : Areas covered by Cable System under the Project
- : Telephone Office (Existing)
- : Telephone Office (Plan)
- : Subscriber Station for Digital MAS

Locations of Subscriber Stations



## Dangkor District (1/2)

No.	Subscriber Station	Required Tower	Power Supply	Important Subscriber	No. of Lines	Application	Remarks
1-1	Chom Chao	18 m	exist	Commune Police	2	18 R	
1-2	Krang Pong Ror	18 m	no (near)	Commune Police Hospital : 20m	3	18 R	
1-3	Som Rong Krom	15 m	from prvt. E/G	Commune Police Clinic P. School : 200m	4	15 R	
1-4	Prey Veng	23 m	no	Commune Police Hospital : 100m	3	23 S	
1-5	Koh Ro Ka	18 m	no	Commune Police Clinic	3	18 S	
1-6	Pong Toeuk	23 m	no	Commune Police P. School : 10m S. School : 50m	4	23 S	
1-7	Dangkor	18 m	no (near)	Commune Police Hospital : 100m	3	18 R	
1-8	Choeung Ek	23 m	no	Commune Police	2	23 S	
1-9	Prey Sor	23 m	no	Commune Police Hospital : 100m P. School : 50m P. School : 50m	5	23 S	
1-10	Tro Peng Kronsang	15 m	no	Commune Police Hospital : 200m	3	15 S	
1-11	Kraing Thnung	15 m	from prvt. E/G	Commune Police Clinic	3	15 R	
1-12	Phloeung Chheh Roteh	15 m	from prvt. E/G	Commune Police P.School : 100m	3	15 R	
1-13	Pro Teah Lang	23 m	no	Commune Police Clinic	3	23 S	
1-14	Sak Sam Pov	18 m	no	Commune Police Hospital : 30 m	3	18 S	
1-15	Missionary of Charity Home of Peace	15 m	E/G	NGO's branch office Hospital	2	15 R	
1-16	CMAC (Cambodia Mine Action Center)	15 m	no	CMAC	1	15 S	
1-17	Road Construction Center	18 m	exist	Road Construction Center	1	18 R	Friendship Project of Japan
1-18	Technical School	15 m	E/G	Technical School	1	15 R	
1-19	Agricultural Engineering Workshop	15 m	E/G	Workshop	1	15 R	



## Dangkor District (2/2)

No.	Subscriber Station	Required Tower	Power Supply	Important Subscriber	No. of Lines	Application	Remarks
1-20	Phloeung Chheh Roteh Hospital	15 m	no	Hospital	1	15 S	
1-21	Choeung Ek Hospital	15 m	no	Hospital	1	15 S	

## Rossey Keo District (1/1)

No.	Subscriber Station	Required Tower	Power Supply	Important Subscriber	No. of Lines	Application	Remarks
2-1	Rossey Keo District Office	18 m	from prvt. E/G	District Off.	1	18 R	
2-2	Svay Pak	15 m	no (50m)	Commune Police	2	15 R	
2-3	Chrang Cham Reh-1	15 m	from prvt. E/G	Commune	1	15 R	
2-4	Chrang Cham Reh-2	15 m	from prvt. E/G	Commune Police P.School : 100m	3	15 R	
2-5	Phnom Penh Tmey	15 m	from prvt. E/G	Commune	1	15 R	
2-6	Khmounh	15 m	E/G	Commune Police : 20m Hospital : 100m P. School : 100m	4	15 R	
2-7	Kilometre Lek Pramouy	18 m	from prvt. E/G	Commune Police	2	18 R	
2-8	Prek Leap	18 m	no	Commune Police : 100m Hospital : 100m	3	18 S	
2-9	Prek Ta Sek	15 m	small prvt. E/G (2 KVA)	Commune Police : 200 m P.School	3	15 S	In rainy season, the access is difficult.
2-10	Agricultural School	18 m	no	Agricultural School	1	18 S	
2-11	District Hospital	18 m	no	District Hospital	1	18 S	
2-12	Fishery Department	15 m	no (50 m)	Fishery Department	1	15 R	
2-13	Samdech Euv Hospital	18 m	from prvt. E/G	Hospital	1	18 R	under control of M. of Health
2-14	Cambodian Urban Health Care Association	15 m	from prvt. E/G	Office Hospital	2	15 R	
2-15	Cambodian Red Cross	18 m	from prvt. E/G	Office	1	18 R	
2-16	Khmer Women Islamic Association of Princess Marie Rananuou	18 m	from prvt. E/G	NGO Office Hospital	2	18 R	National NGO
2-17	District Inspection Office	18 m	from prvt. E/G	Police Education Section of District Office : 100m	2	18 R	

## Meanchey District (1/1)

No.	Subscriber Station	Required Tower	Power Supply	Important Subscriber	No. of Lines	Application	Remarks
3-1	Meanchey District Office (& Chbar Ampov-1: 120m)	18 m	exist	District Office C.Ampov-1 Commune : 120 m Police : 100m Hospital : 70 m	4	18 R	
3-2	Chbar Ampov-2	15 m	exist	Commune Police P. School : 100m Tax Office : 30 m	4	15 R	
3-3	Ni Roth	23 m	no (200 m)	Commune Police : 200m P. School	3	23 R	
3-4	Chak Ang Re Loeu	18 m	exist	Commune Police P. School : 20m	3	18 R	
3-5	Chak Ang Re Krom	23 m	exist	Commune Police	2	23 R	
3-6	Boeung Tum Pun	23 m	exist	Commune Police:150m P. School : 50m	3	23 R	
3-7	Stoeung Mean Chey	18 m	exist	Commune Police :100m	2	18 R	
3-8	Prek Pra	15 m	from prvt. E/G	Commune	1	15 R	
3-9	Radio Broadcasting Center	18 m	exist	Radio Broadcasting Center	1	18 R	
3-10	Chak Ang Re Krom Hospital	15 m	exist	Hospital Branch of Construction Dep. : 200 m	2	15 R	
3-11	Stoeung Mean Chey Hospital	15 m	exist	Hospital	1	15 R	
3-12	Prek Pra Police Station	15 m	exist	Police	1	15 R	

## Por Nhea Loeu District (1/1)

No.	Subscriber Station	Required Tower	Power Supply	Important Subscriber	No. of Lines	Application	Remarks
4-1	Por Nhea Loeu District Office	18 m	no (100 m)	District Office Police Dist. Hosp : 200m P.School : 100m S.School : 100m	5	18 R	
4-2	Prek Phnov	18 m	from prvt. E/G (50m)	Commune Police	2	18 R	

## Annex II

### Japan's Grant Aid Scheme

#### 1. Grant Aid Procedures

- 1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

#### 2. Basic Design Study

- 1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the



Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project
- e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

## 2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.



### 3. Japan's Grant Aid Scheme

#### 1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

#### 2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

#### 3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

#### 4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)



5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities outside the sites.
- (3) To ensure prompt unloading and customs clearance at the port of disembarkation and internal transportation therein of the products purchased under the Grant Aid.
- (4) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (5) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

24

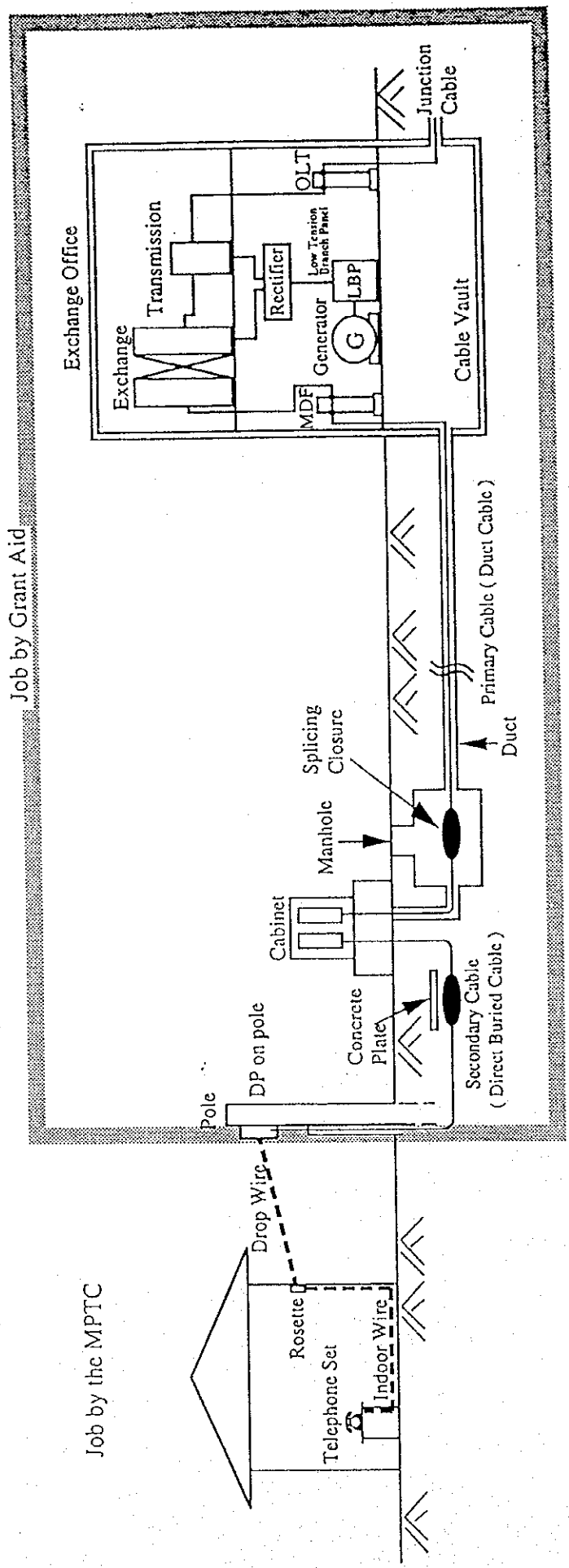
9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.



21

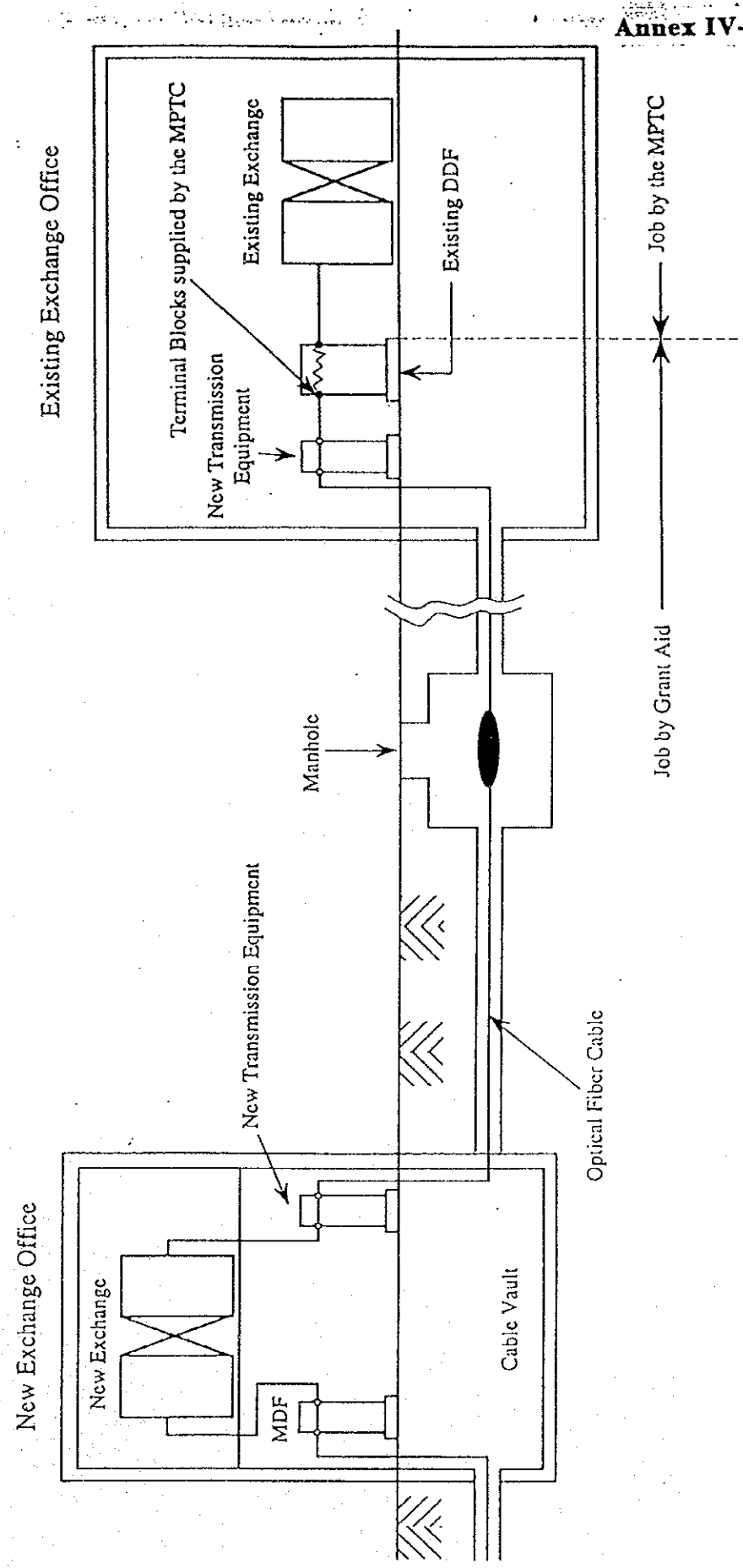
# Job Demarcation for Construction of Cable Distribution Network





21

### Job Demarcation regarding Connection between newly installed Transmission Equipment and the existing Exchanges



MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR  
THE DEVELOPMENT OF THE TELECOMMUNICATIONS NETWORK  
FOR  
PHNOM PENH CITY IN THE KINGDOM OF CAMBODIA  
(EXPLANATION FOR THE DRAFT BASIC DESIGN REPORT)

In April, 1995, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for the Development of the Telecommunications (hereinafter referred to as "the Project") to the Kingdom of Cambodia, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft basic design report of the study.

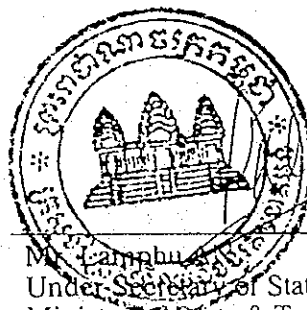
In order to explain and to consult Cambodian side on the components of the draft report, JICA sent to Cambodia a study team, which is headed by Mr. Toshinobu KATO, Second Basic Design Study Division, Grant Aid Study & Design Department, JICA, and is scheduled to stay in the country from June 6 to 12, 1995.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Phnom Penh, June 9, 1995



Mr. Toshinobu KATO  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency



Mr. Lambu  
Under Secretary of State  
Ministry of Posts & Telecommunications  
Cambodia

## Attachment

### (1) Components of the draft report

- (a) The Royal Government of Cambodia has agreed and accepted in principle the components of the draft basic design report proposed by the Team. However, the Cambodian side requested the alteration of location for the West telephone office and the Airport telephone office in Annex I and the Japanese side agreed on that.
- (b) The Cambodian side requested the introduction of a trunk switch in the Central telephone office to connect inter-provincial transmission donated by the Government of Germany, but the Japanese side replied that justification of the request is not sufficient at this stage and more information on the specification is needed.

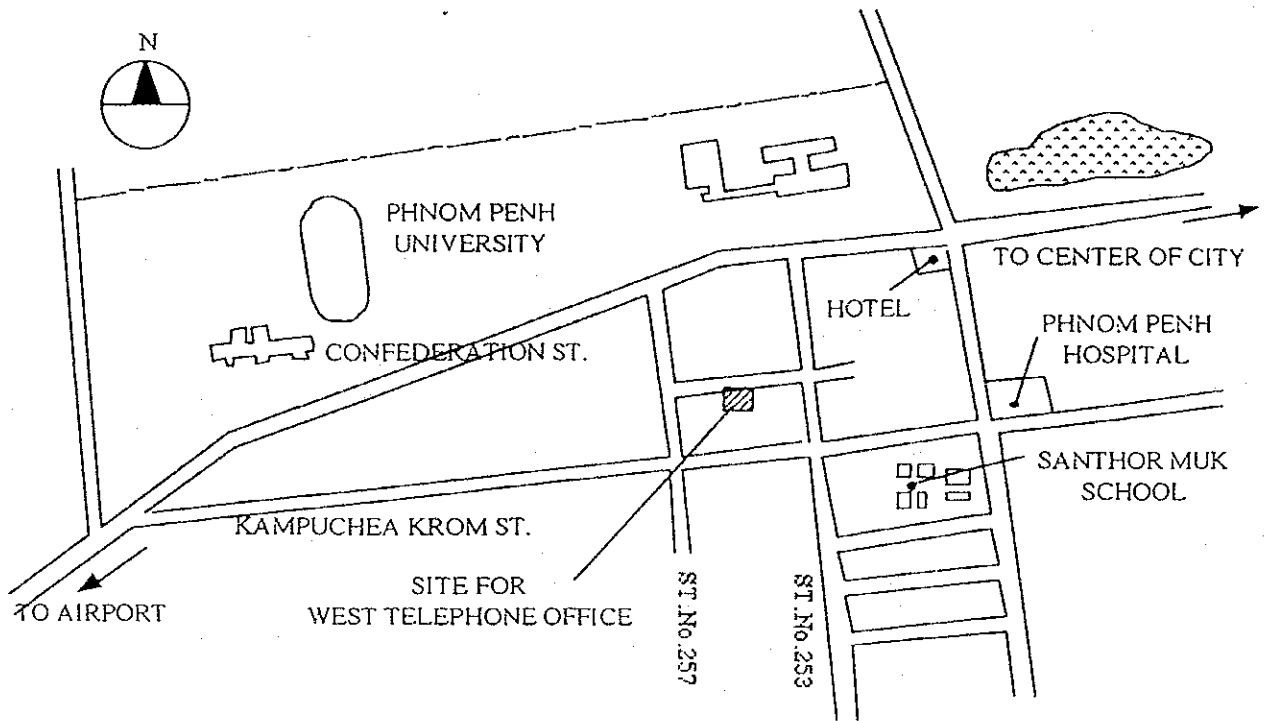
### (2) Japan's Grant Aid System

- (a) The Royal Government of Cambodia has understood the system of Japanese Grant Aid explained by the Team as Annex II.
- (b) The Royal Government of Cambodia will take the necessary measures, described in Annex III, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

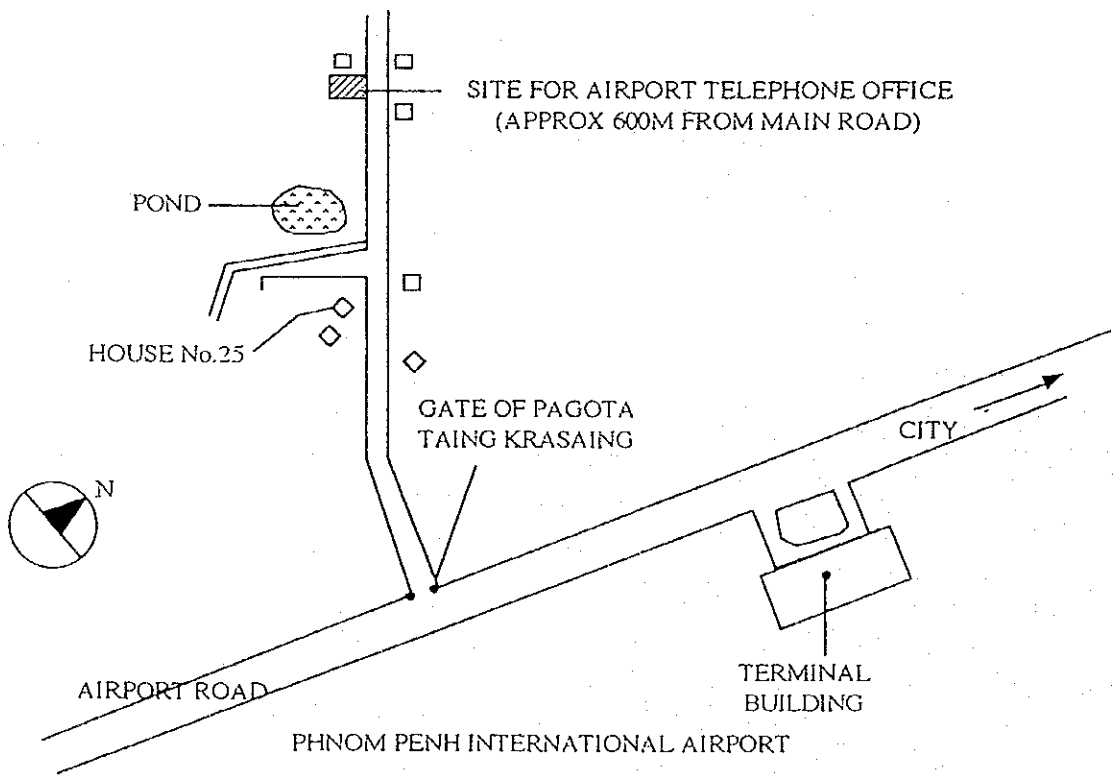
### (3) Future schedule

The Team will make the final report in accordance with the confirmed items, and send it to the Royal Government of Cambodia by the end of July 1995.

Annex I



Location Map for West Telephone Office



Location Map for Airport Telephone Office

## Annex II

### Japan's Grant Aid Scheme

#### 1. Grant Aid Procedures

- 1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

#### 2. Basic Design Study

- 1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the

Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project
- e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

## 2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

### 3. Japan's Grant Aid Scheme

#### 1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

#### 2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

#### 3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

#### 4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.



8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

### Annex III

Necessary measures to be taken by the Royal Government of Cambodia in case Japan's Grant Aid is executed:

1. To provide data and information necessary for the implementation of the Project.
2. To secure a lot of lands necessary for the Project.
3. To demolish the existing training center building prior to the commencement of building construction in the site for the Central telephone office.
4. To demolish the existing storage and houses prior to the commencement of building construction in the site for the West telephone office.
5. To undertake incidental outdoor works such as gardening and exterior lighting in and around the sites.
6. To provide facilities for distribution of electricity for the Central telephone office, water supply, drainage, sewage and other incidental facilities to the Project sites.
7. To conduct final re-pavement of roads after cable installation work and temporary restoration done by a contractor.
8. To remove the existing cables, poles and other facilities which will be disused after installation of new equipment and so on.
9. To provide warehouse to keep equipment and materials to be used for the Project.
10. To bear the following commissions to the Japanese foreign exchange bank for the banking service based upon the Banking Arrangement:
  - 1) Advising commission of the Authorization of Pay (A/P)
  - 2) Payment commission
11. To ensure prompt unloading and customs clearance at the port of disembarkation in Cambodia and internal transportation therein of the products purchased under the Grant.
12. To exempt Japanese nationals involved in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Cambodia with respect to the supply of the products and services under the verified contracts.
13. To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contracts, such facilities as may be necessary for their entry into Cambodia and stay therein for the performance of their work.
14. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.
15. To bear all the expenses, other than those to be borne by the Grant, necessary for the Project.

16. To coordinate and solve any issues related to the Project which may arise with third parties and/or inhabitants living around the site.

Appendix 5. Soil Investigation Data



**SIAM TONE CO., LTD.**

**BORING LOG**

BORING NO. **BH-1**  
SHEET 1 OF 2

PROJECT: Post and Telecommunication Training Center

Coordinates: N - \_\_\_\_\_ E \_\_\_\_\_

Water Level: \_\_\_\_\_ m

LOCATION: The Kingdom of Cambodia

Ground Elevation: \_\_\_\_\_ m

Starting Date: 02/05/1995

CLIENT: Ministry of Post and Telecommunication

Max. Drilling Depth: 21.95 m

Finishing Date: 06/05/1995

Depth (m)	Graphic Log	Soil Description	Sampling Method	Sample No.	Recovery	Plastic Limit Natural Water Content Liquid Limit (%)			Total Unit Weight (Ton/m <sup>3</sup> )	SPT N Blow Count (Blow/ft)
						20	40	60		
1		Top soil and SAND, brown; loose								
2			SS	1						
3		Sandy CLAY, dark grey; medium stiff to stiff	SS	2						
4			SS	3						
5		Lean CLAY, yellowish brown to brown; medium stiff to stiff (CL)	SS	4						
6			SS	5						
7		Lean CLAY, dark greyish brown; medium stiff (CL)	SS	6						
8			SS	7						
9		Lean CLAY, dark grey; stiff	SS	8						
10			SS	9						
11		Organic CLAY, dark grey to black; medium stiff to stiff	SS	10						
12			SS	11						
13		Organic CLAY, dark brown; medium stiff to stiff (OH)	SS	12						
14			SS	13						
15			SS	14						
16			SS	15						
17		Clayey SAND, dark brown; stiff	SS	16						
18			SS	17						
19		Lean CLAY, greyish brown; stiff to very stiff (CL)	SS	18						
20			SS	19						
21			SS	20						
22			SS	21						
23			SS	22						
24			SS	23						
25			SS	24						
26			SS	25						
27		Sandy CLAY, greyish green; hard	SS	26						
28			SS	27						
29		CLAY, dark brown, very stiff	SS	28						
30			SS	29						
31		Coarse SAND, greyish brown; medium dense to dense	SS	30						
32			SS	31						
33		Clayey SAND, light brown to brown; medium dense to dense (SC)	SS	32						
34			SS	33						
35			SS	34						
36			SS	35						
				36						





**SIAM TONE CO., LTD.**

**BORING LOG**

BORING NO. **BH-2**  
SHEET 1 OF 2

PROJECT: Post and Telecommunication Training Center  
LOCATION: The Kingdom of Cambodia  
CLIENT: Ministry of Post and Telecommunication

Coordinates: N -        E         
Ground Elevation:        m  
Max. Drilling Depth: 24.95 m

Water Level:        m  
Starting Date: 08/05/1995  
Finishing Date: 10/05/1995

Depth (m)	Graphic Log	Soil Description	Sampling Method	Sample No.	Recovery	Plastic Limit Natural Water Content (%) Liquid Limit			Total Unit Weight (Ton/m <sup>3</sup> )	SPT N Blow Count (Blow/ft)
						20	40	60		
1		Silty SAND, dark greyish brown; very loose	SS	1						
2			SS	2						
3			SS	3					3.00 m	
4		SS	4	Lean CLAY, dark grey; soft					SS	5
5		SS	6						4.00 m	
6		SS	7	Silty SAND, dark greyish brown; very loose to loose (SM)					SS	8
7		SS	9						5.00 m	
8		SS	10							
9		SS	11	Lean CLAY, dark grey; medium stiff to stiff (CL)					SS	11
10		SS	12						8.00 m	
11		SS	13							
12		SS	14	Fat CLAY, dark grey; medium stiff to stiff (CH)					SS	14
13		SS	15						10.50 m	
14		SS	16							
15		SS	17	Organic CLAY, dark grey to black; stiff (OH)					SS	17
16		SS	18						11.50 m	
17		SS	19							
18		SS	20	Lean CLAY, greyish brown; medium stiff to stiff (CL)					SS	20
19		SS	21						14.50 m	
20	SS	22								
21	SS	23	Lean CLAY, dark greyish brown; very stiff to hard (CL)	SS	23					
22	SS	24		17.00 m						
23	SS	25								
24	SS	26	Sandy CLAY, greyish brown; very stiff to hard	SS	26					
25	SS	27		18.00 m						
26	SS	28								
27	SS	29	Medium to coarse SAND, light brown; medium dense to dense	SS	29					
28	SS	30		14.50 m						
29	SS	31								
30	SS	32	Medium to coarse SAND, light brown; medium dense to dense	SS	32					
31	SS	33		17.00 m						
32	SS	34								
33	SS	35	Medium to coarse SAND, light brown; medium dense to dense	SS	35					
34	SS	36		18.00 m						
35	SS	37								
36	SS	38	Medium to coarse SAND, light brown; medium dense to dense	SS	38					
37	SS	39		18.00 m						
38	SS	40								



**SIAM TONE CO., LTD.**

**BORING LOG**

BORING NO. **BH-2**

SHEET 2 OF 2

PROJECT: Post and Telecommunication Training Center

LOCATION: The Kingdom of Cambodia

CLIENT: Ministry of Post and Telecommunication

Coordinates: N. \_\_\_\_\_ E. \_\_\_\_\_

Ground Elevation: - \_\_\_\_\_ m

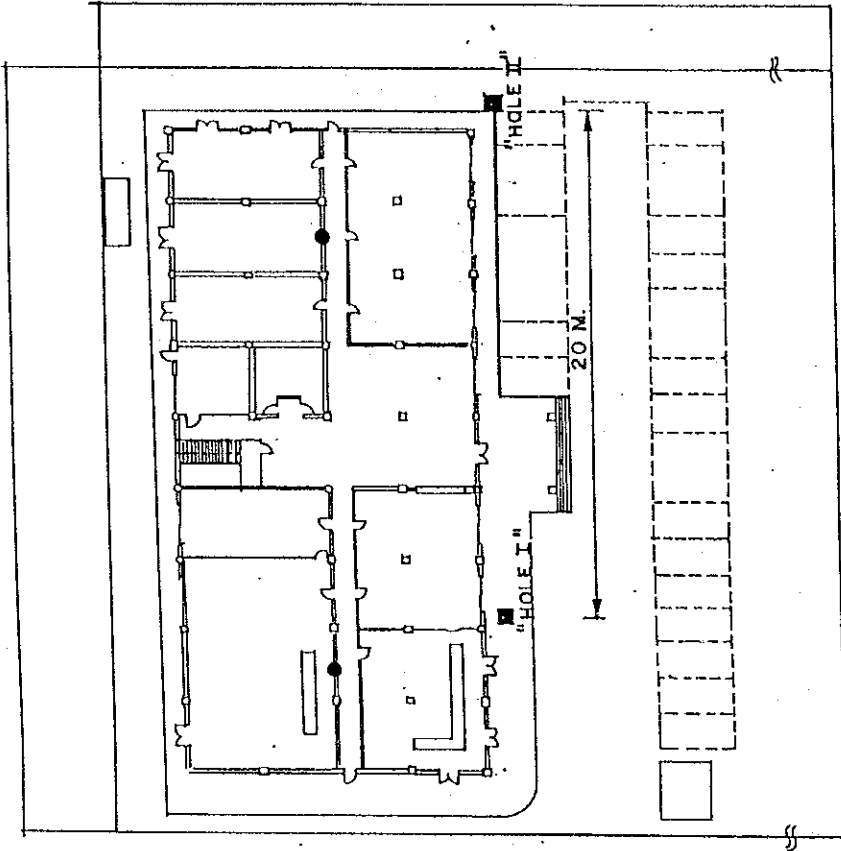
Max. Drilling Depth: **24.95** m

Water Level: \_\_\_\_\_ m

Starting Date: 08/05/1995


Finishing Date: 10/05/1995

Depth (m)	Graphic Log	Soil Description	Sampling Method	Sample No.	Recovery	Plastic Limit Natural Water Content (%) Liquid Limit			Total Unit Weight (Ton/m <sup>3</sup> )	SPT N Blow Count (Blow/ft)								
						20	40	60			80							
21		Sandy lean CLAY, light brown; very stiff to hard	SS	41														
22																		
23																		
24																		
24.95 m																		
25				End of Boring at 24.95 m														
26																		
27																		
28																		
29																		
30																		
31																		
32																		
33																		
34																		
35																		
36																		
37																		
38																		
39																		



NOTE.

- BORING LOCATION HOLE I, II

PROJECT: SOIL INVESTIGATION			
SHOWN:	SOIL PROFILE	REVISION	
DATE: 17/5/95	SCALE: -		
DRAWN:			
CONTRACTOR			
 <b>SIAM TONE CO., LTD.</b>			
5/15 Moo 6 (K.m.15) Bangna-Trad Road, Bangplee, Samutprakan 10540 Tel. 3125281-300 Fax. 3125304			
			DWG. NO.